KINROSS Fort Knox

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Delivery: kyle.moselle@alaska.gov

December 14, 2017

Kyle Moselle
Department of Natural Resources
Office of Project Management and Permitting
400 Willoughby Street
Juneau, AK 99801-01019

Re: FGMI Fish Creek East Waste Rock Dump

Dear Mr. Moselle:

Fairbanks Gold Mining, Inc. (FGMI) is requesting an amendment to the Plan of Operations for the Fort Knox Gold Mine. FGMI proposes to expand the site's waste rock dumps to include the proposed Fish Creek East Waste Rock Dump (FCEWRD).

The submittal package includes:
- Fort Knox Mine Plan of Operations Amendment Request, Fish Creek East Waste Rock Dump, December 14, 2017
- Fairbanks Gold Mining Inc., Fort Knox Project, Fish Creek East Waste Rock Dump Report on Geotechnical Evaluation of Dump Construction over Existing Tailing, September 29, 2017

Should you have any questions, please contact me at 970-490-2287 or mark.huffington@kinross.com.

Sincerely,

Mark A Huffington

Mark A. Huffington
Environmental Superintendent

Cc: Brent Martellaro, ADNR, brent.martellaro@alaska.gov
Tim Pilon, ADEC, tim.pilon@alaska.gov
Bartly Kleven, FGMI, bartly.kleven@kinross.com
Craig Natrop, FGMI, craig.natrop@kinross.com

Fort Knox Mine
Plan of Operations Amendment Request

Fish Creek East Waste Rock Dump

December 14, 2017

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Figures

Attachments

Abbreviations

amsl	above mean sea level
BCHLF	Barnes Creek Heap Leach Facility
BCWRD	Barnes Creek Waste Rock Dump
cy	cubic yard
DEC	Alaska Department of Environmental Conservation
DNR	Alaska Department of Natural Resources
FEMA	Federal Emergency Management Agency
ft	feet
ft^2	square feet
FCEWRD	Fish Creek East Waste Rock Dump
FGMI	Fairbanks Gold Mining, Inc.
Fort Knox	Fort Knox Mine
gpm	gallons per minute
H	horizontal
hr	hour
lb/cf	pounds per cubic feet
LCRS	leachate collection and recovery system
M	million
Mt	million tons
PCMS	process component monitoring system
PFS	prefeasibility study
TSF	tailings storage facility
V	vertical
WCHLF	Walter Creek Heap Leach Facility
WRD	waste rock dump
YPWRD	Yellow Pup Waste Rock Dump
yr	year

1.0 INTRODUCTION

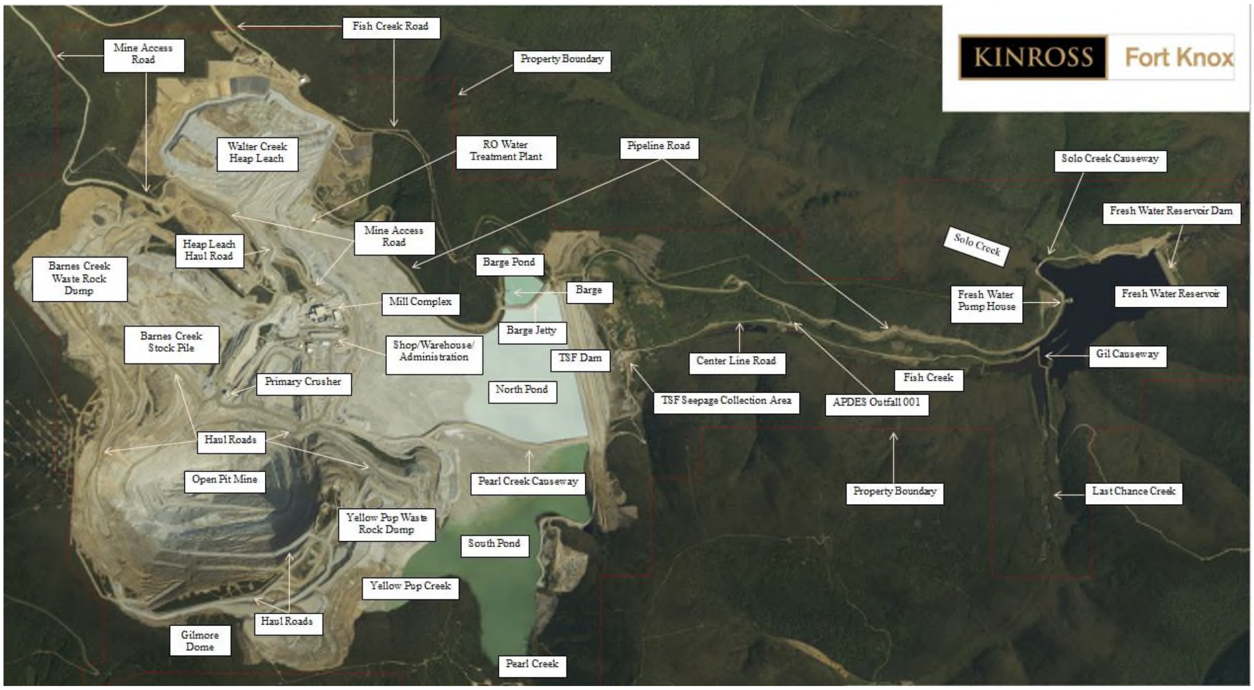
Fairbanks Gold Mining, Inc. (FGMI) is requesting a Plan of Operations amendment approval at its Fort Knox Mine (Fort Knox) for the Fish Creek East Waste Rock Dump. FGMI proposes to expand the site's waste rock dumps to include the proposed Fish Creek East Waste Rock Dump (FCEWRD). The proposed FCEWRD extends from the north side of the Yellow Pup Waste Rock Dump, the east side of the Fish Creek Waste Rock Dump/Fish Creek low-grade stockpiles, and on the southwest corner of the tailings storage facility's North Pond (Attachment 1).

1.1 Site Description

Fort Knox is owned and operated by FGMI, a wholly owned subsidiary of Kinross Gold USA, Inc. Fort Knox is located in the Fairbanks North Star Borough, approximately 26-road miles northeast of Fairbanks, Alaska (Figure 1). It is located along a belt of lode and placer deposits that comprise one of the highest gold-producing areas in Alaska. The deposit at Fort Knox is mined by conventional open-pit methods on a year-round basis, seven days per week. Fort Knox processes ore onsite at a carbon in-pulp mill with a daily capacity of up to 45,000 tons. In recent years, Fort Knox has produced approximately 350,000 to 400,000 ounces of gold annually. Major site facilities include the active open pit mine, mill, tailings storage facility (TSF), waste rock dumps, water storage reservoir, and the Walter Creek Valley Heap Leach Facility (Figure 2).

Figure 1: Site Location

Figure 2: Mine Facilities



2.0 Fish Creek East Waste Rock Dump

FGMI proposes to expand the site's waste rock dumps to include the proposed Fish Creek East Waste Rock Dump (FCEWRD). The proposed FCEWRD extends from the north side of the Yellow Pup Waste Rock Dump, the east side of the Fish Creek Waste Rock Dump/Fish Creek low-grade stockpiles, and on the southwest corner of the tailings storage facility's North Pond. Attachments 1 through 3 identify the location, cross-section, and the geologic conditions of the waste rock dump.

Additional mine waste capacity will be needed for operations of the Fort Knox pit including the pit's east wall, which is an extension of mining Phase 8 (Attachment 4) . Approximately 85 million tons of waste rock will be placed on the FCEWRD. The ultimate elevation of the FCEWRD is 1950 ft amsl. Knight Piésold Consulting (KP) completed geotechnical investigations and engineering analysis of the proposed layout of the *Fish Creek East WRD and presented their findings in the FCEWRD Geotechnical Evaluation of Dump Construction over Existing Tailings*, September 29, 2017, which is provided with this amendment request. The KP investigation and engineering analysis consisted of two distinct areas, which the KP report reflects (large pyramidal zone and narrow cross-valley zone; however, only the large pyramidal zone is proposed for construction at this time at the current Fish Creek East area. A summary of the KP report is discussed below.

During the period from February 28, 2017 through March 10, 2017, the geotechnical site investigation was completed comprising CPT and sonic drilling with direct sampling of tailing material impounded within the TSF. This program consisted of nine locations where CPTs were advanced and adjacent sonic drill holes were also advanced for the purpose of sample collection. A subset of samples were sent to the Knight Piésold geotechnical laboratory in Denver for index and moisture content testing. In general, it was found that the tailing in the vicinity of the Fish Creek East waste rock dump characterized in a similar way to the coarse grained tailing located in the vicinity of the Yellow Pup waste rock dump; however, numerous layers of uncharacteristically stiff material were identified within the deposit in this area. These layers were often overlain and underlain by softer layers similar to what has been identified elsewhere within the facility. Substantial zones of excess pore pressures (in excess of hydrostatic conditions) were also identified during the current site investigation. This finding viewed in conjunction with the finding of stiff layers within the deposit indicated that there may be semi-continuous layers of frozen tailing buried within the deposit in the vicinity of the Fish Creek East WRD. These stiff zones were generally not taken into account for subsequent geotechnical engineering analyses because it is possible that these layers will not remain frozen in the future. The excess pore pressures identified due to the existence of the frozen layers were taken into account.

Geotechnical material properties were developed for the tailing, mine waste rock and bedrock foundation based on a combination of: (1) current site investigation and laboratory testing and site investigation data, (2) historic laboratory testing and site investigation data, and (3) literature values and experience with similar materials. Unit weights and failure criterions were developed for limit equilibrium slope stability analyses. Stress-strain relationships were also developed for the earthquake-induced deformation analyses.

Limit equilibrium slope stability analyses were performed on the critical sections for both the pyramidal and cross valley portions of the WRD. The slope stability analyses were conducted under static, post-construction, and post-earthquake loading conditions. Appropriate undrained shear strength parameters were utilized for the tailing under post-construction and post-earthquake slope stability analyses. It was assumed that the mine waste rock and foundation bedrock would not lose strength due to undrained loading due to the nature of those materials. Static and post-construction factors of safety were shown to meet applicable minimum acceptable factors of safety for all of the cases considered. Post-earthquake stability analyses indicated factors of safety of less than 1.0 upon the occurrence of the maximum design earthquake (MDE). It must be understood that such results do not necessarily indicate unacceptable performance of the facility but rather that some permanent earthquake-induced deformations of the slope are anticipated. Acceptable performance is then based on the estimated magnitude and anticipated consequence of such movements. As such, finite-difference earthquake-induced deformation analyses were performed to quantify those anticipated movements (Figure 3, Summary of Limit Equilibrium Slope Stability Analysis Results).

The earthquake-induced deformation analyses were performed at the full build-out configurations on the critical sections for the pyramidal and cross valley portions of the WRD. The models were first built up in stages to achieve an accurate representation of the in-situ total and effective stresses prior to earthquake shaking. Each model was then subject to the loading associated with the occurrence of the MDE. Three separate acceleration time histories were utilized as recommended in the seismic hazard assessment developed for the Fort Knox site.

The results of the earthquake-induced deformation analyses show a maximum settlement observed within the pyramidal portion and cross valley portion of the waste rock dump of approximately 4 feet and 10 feet, respectively. Horizontal displacements observed within the pyramidal portion and cross valley portion of the waste rock dump are approximately 4 feet and 17 feet, respectively. The displacement histories recorded during earthquake loading indicate a gradual increase in the displacements that stop shortly after shaking. These displacements, while significant, are not likely to impact the operation, capacity or freeboard of the TSF and are considered acceptable for this type of facility.

The results of the geotechnical engineering analyses indicate that the performance of the proposed configurations of the pyramidal and cross valley portions of the WRD should be acceptable provided that the conditions modeled are representative of those in the field; however, due to the variation in site conditions observed in the vicinity of the proposed WRD compared with what has been observed elsewhere, there is additional uncertainty regarding the anticipated behavior of the tailing deposit in this location with respect to the propensity for pore pressure dissipation during construction or following an earthquake event. Because of this, FGMI should pay close attention to the performance of the slope faces during construction. To maintain a safe working environment, frequent inspections of the advancing face and emplaced mine waste rock should be made. Consideration should be given to any signs of distress (e.g., tension cracking parallel to the advancing face, bulging of the slope above the toe, water or tailing ejected on the surface of the mine waste rock fill, etc.) before work proceeds in that vicinity. Once the initial lift of mine waste rock is in place, it is strongly recommended that vibrating wire piezometers be installed via drill holes through the mine waste rock into the underlying tailing to monitor excess pore pressures induced by ongoing construction, which could be indicative of a pending undrained failure. It is possible that pore pressures will take longer to dissipate in this area due to the layers of frozen tailing indicated by the site investigation program. Installation of the piezometers should allow for optimized sequencing of mine waste rock placement to reduce the risk of undrained slope failure during construction. It would also be advisable to install survey monuments to monitor settlement and horizontal movement near and along the slope of the WRD.

Figure 3: Summary of Limit Equilibrium Slope Stability Analysis Results

Analysis Type	Section	Description	Computed Factor of Safety
Static	A	Full Build Out Downstream	2.4
	B	Full Build Out Downstream	3.0
Post-Earthquake	A	Full Build Out Downstream	0.7
	B	Full Build Out Downstream	0.3
Post-Construction	A	Lift #1 Downstream	1.0
		Lift #2 Downstream	1.1
		Lift #3 Downstream	1.2
		Lift #4 Downstream	1.2
		Lift #5 Downstream	1.2
		Lift #6 Downstream	1.2
		Lift #7 Downstream	1.2
		Lift #8 Downstream	1.2
	B	Lift #1 Downstream	1.0
		Lift #1 Upstream	1.0
		Lift #2 Downstream	1.2
		Lift #2 Upstream	1.2
		Lift #3 Downstream	1.2
		Lift #3 Upstream	1.2

Notes:
1. Sections A & B are shown on Attachment 1, Proposed Waste Rock Dump Layout
2. SLOP/W output plots included in Appendix D, FCEWRD Report on Geotechnical Evaluation of Dump Construction Over Existing Tailing, September 29, 2017

2.1 Reclamation

Reclamation of the FCEWRD is included in the Phase 9 Pit Expansion amendment to the *Fairbanks Gold Mining, Inc., Reclamation Plan and Closure Plan, November 2013, Rev 2*. The amendment is provided as a separate document.

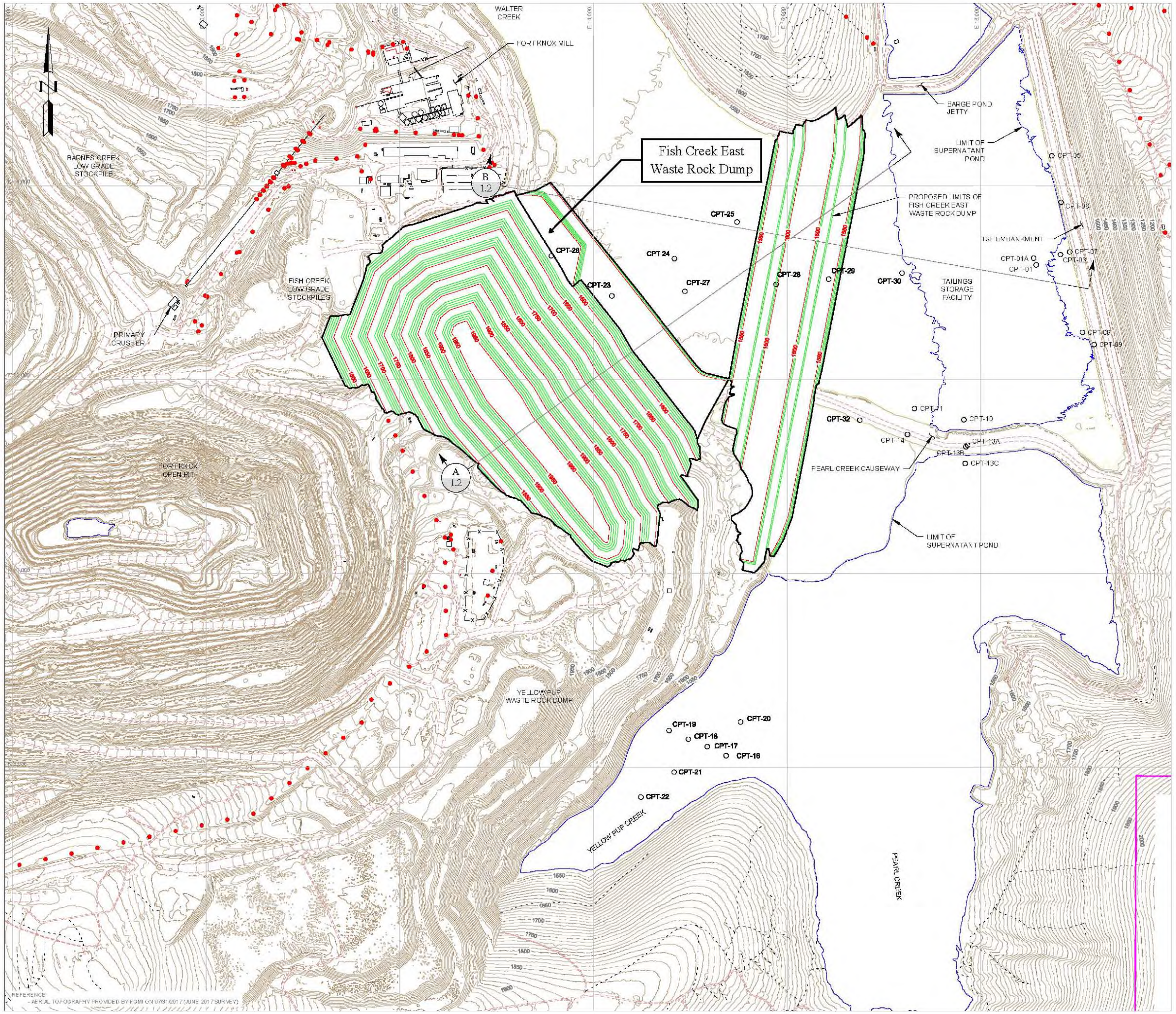
2.2 Wetlands

The FCEWRD location is in the mine's disturbed area, which does not include any wetlands.

3.0 REFERENCES

Knight Piésold Consulting, 2017, *Fairbanks Gold Mining Inc. Fort Knox Project Fish Creek East Waste Rock Dump Report on Geotechnical Evaluation of Dump Construction over Existing Tailing*, September 29, 2017.

Knight Piésold Consulting, 2013, *Fairbanks Gold Mining Inc. Fort Knox Project Yellow Pup Waste Rock Dump Report on Geotechnical Evaluation of Dump Expansion over Existing Tailing, November 4*, *2013.*



LEGEND:

- 1500 GROUND CONTOUR AND EL. FEET (MSL)
- ROAD
- FGMI PROPERTY BOUNDARY
- STRUCTURE
- FENCE
- TRAIL
- STREAM
- CPT-01 COMPLETED CPT PROBE LOCATION AND DESIGNATION

CPT PROBE DETAILS

CPT No.	NORTHING (ft)	EASTING (ft)	EXISTING GROUND ELEVATION (fmsl)	APPROXIMATE PROBE DEPTH (ft)
CPT-23	12,862.07	14,190.44	1,543.6	240
CPT-24	13,245.30	14,838.73	1,540.4	255
CPT-25	13,628.23	15,484.19	1,537.1	175
CPT-26	13,275.14	13,566.51	1,544.2	250
CPT-27	12,909.32	14,947.20	1,539.8	255
CPT-28	12,980.24	15,886.81	1,536.7	260
CPT-29	13,034.64	16,431.56	1,534.4	305
CPT-30	13,096.80	17,187.36	1,530.1	315
CPT-31	CPT ELIMINATED FROM PROGRAM			
CPT-32	11,582.08	16,751.84	1,543.1	225

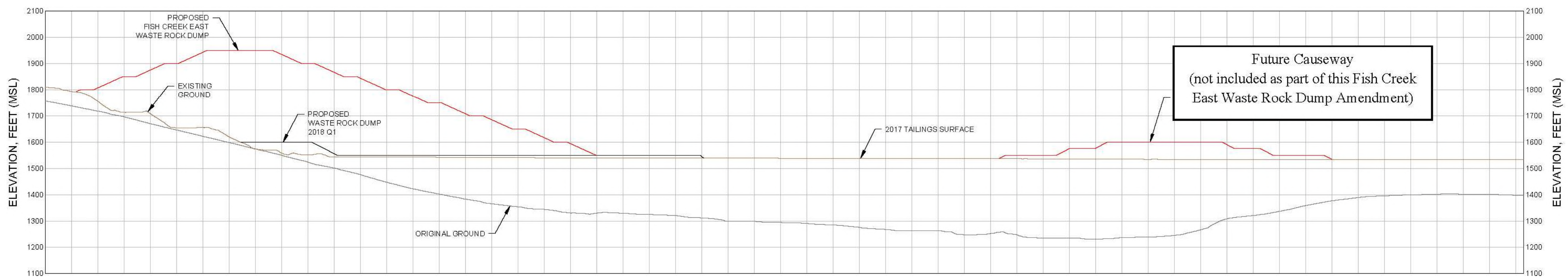
NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

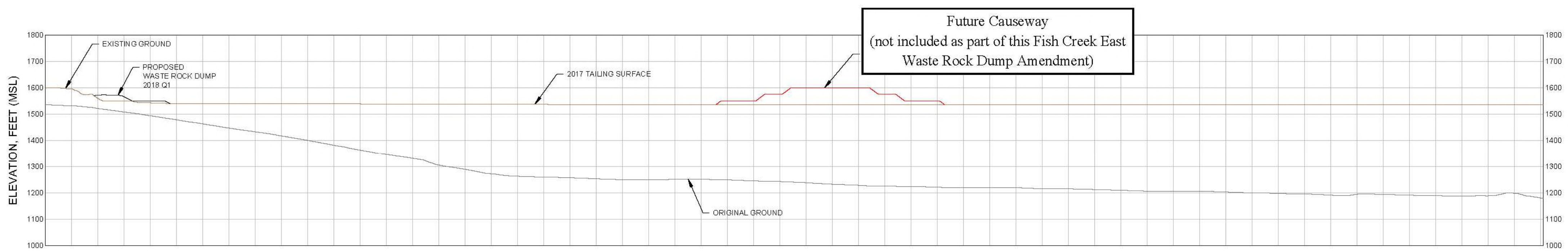
500 0 500 1000 FEET

1"=500' AT FULL SIZE (ANSI D)
1"=1000' AT HALF SIZE (ANSI B)

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP				
TITLE	PROPOSED WASTE ROCK DUMP LAYOUT				
CLIENT	FAIRBANKS GOLD MINING, INC.				
	Knight Piésold CONSULTING				
DESIGNED BY	PD	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	CB	DV101	00336.08	1.1	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		



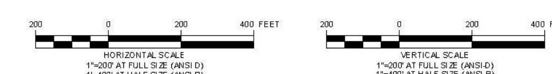
A 1.1 FISH CREEK EAST WASTE ROCK DUMP CROSS SECTION
NORMAL TO NORTHEASTERN DUMP FACE



B 1.1 CROSS VALLEY WASTE ROCK DUMP CROSS SECTION
NORMAL TO EASTERN DUMP FACE

NOTES:

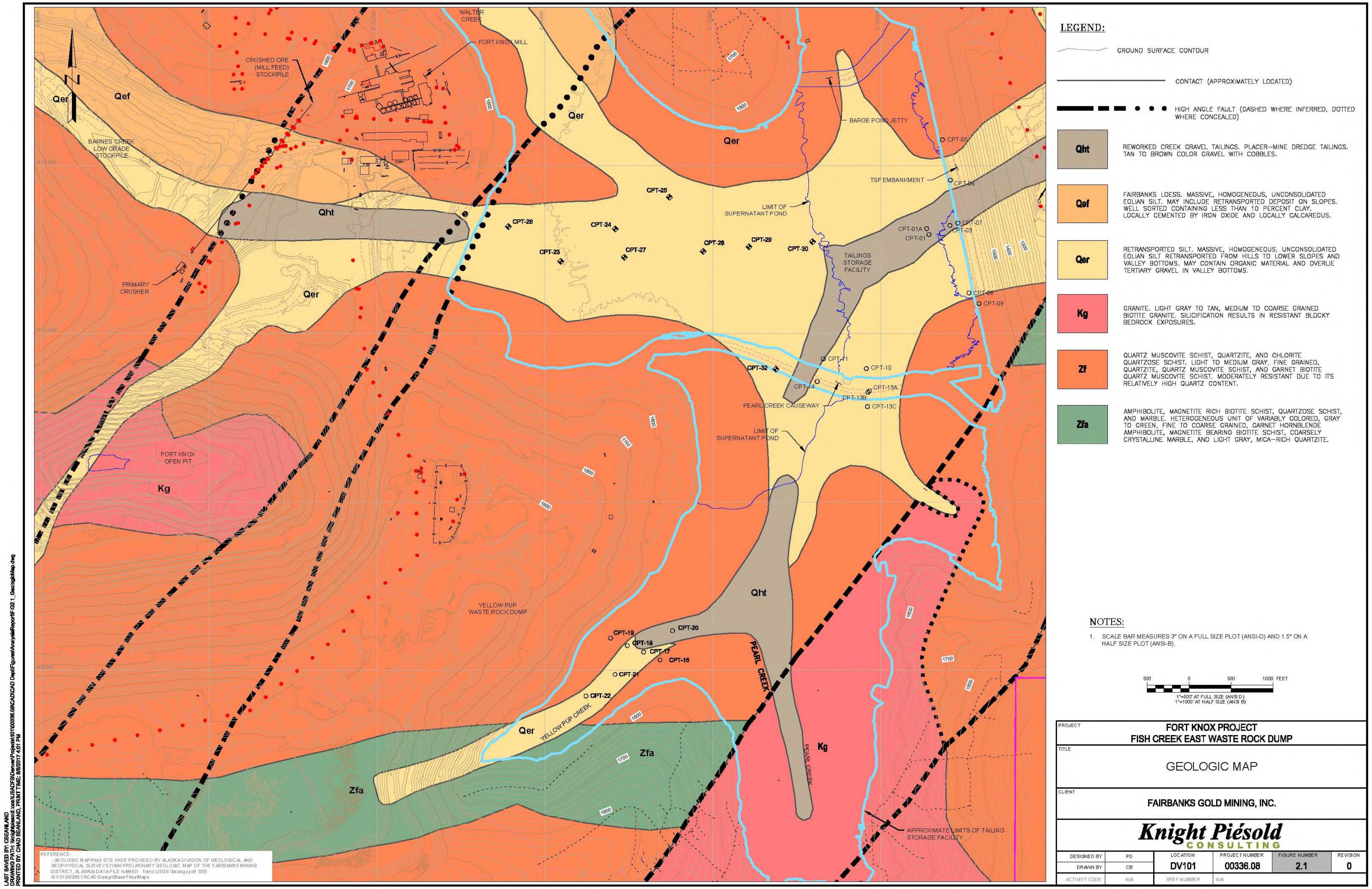
1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

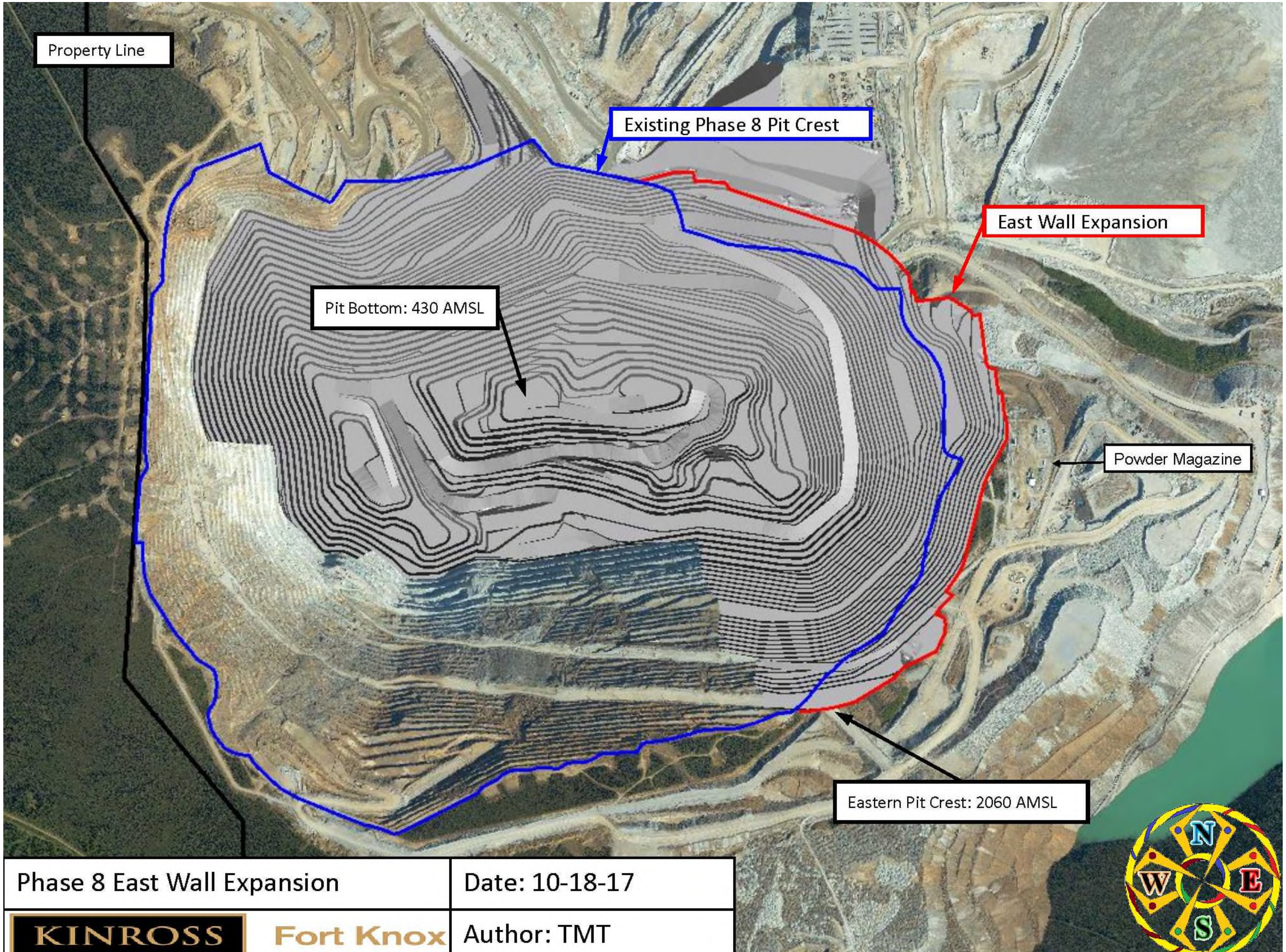


PROJECT	FORT KNOX PROJECT ADDITIONAL WASTE ROCK DUMP CAPACITY
TITLE	PROPOSED WASTE ROCK DUMP CROSS SECTIONS
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	PD	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	CB	DV101	00336.08	1.2	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		


CRUSHED ORE (MILL FEED) STOCKPILE
FORT KNOX MILL
WALTER CREEK
BARNES CREEK LOW GRADE STOCKPILE
PRIMARY CRUSHER
FORT KNOX OPEN PIT
YELLOW PUP WASTE ROCK DUMP
YELLOW PUP CREEK
PEARL CREEK
BARGE POND JETTY
TSF EMBANKMENT
LIMIT OF SUPERNATANT POND
TAILINGS STORAGE FACILITY
PEARL CREEK CAUSEWAY
APPROXIMATE LIMITS OF TAILING STORAGE FACILITY
Qer
Qef
Qht
Kg
Zfa
LEGEND:
GROUND SURFACE CONTOUR
CONTACT (APPROXIMATELY LOCATED)
HIGH ANGLE FAULT (DASHED WHERE INFERRED, DOTTED WHERE CONCEALED)
Qht REWORKED CREEK GRAVEL TAILINGS. PLACER-MINE DREDGE TAILINGS. TAN TO BROWN COLOR GRAVEL WITH COBBLES.
Qef FAIRBANKS LOESS. MASSIVE, HOMOGENEOUS, UNCONSOLIDATED EOLIAN SILT. MAY INCLUDE RETRANSPORTED DEPOSIT ON SLOPES. WELL SORTED CONTAINING LESS THAN 10 PERCENT CLAY. LOCALLY CEMENTED BY IRON OXIDE AND LOCALLY CALCAREOUS.
Qer RETRANSPORTED SILT. MASSIVE, HOMOGENEOUS, UNCONSOLIDATED EOLIAN SILT RETRANSPORTED FROM HILLS TO LOWER SLOPES AND VALLEY BOTTOMS. MAY CONTAIN ORGANIC MATERIAL AND OVERLIE TERTIARY GRAVEL IN VALLEY BOTTOMS.
Kg GRANITE. LIGHT GRAY TO TAN, MEDIUM TO COARSE GRAINED BIOTITE GRANITE. SILICIFICATION RESULTS IN RESISTANT BLOCKY BEDROCK EXPOSURES.
Zf QUARTZ MUSCOVITE SCHIST, QUARTZITE, AND CHLORITE QUARTZOSE SCHIST. LIGHT TO MEDIUM GRAY, FINE GRAINED, QUARTZITE, QUARTZ MUSCOVITE SCHIST, AND GARNET BIOTITE QUARTZ MUSCOVITE SCHIST. MODERATELY RESISTANT DUE TO ITS RELATIVELY HIGH QUARTZ CONTENT.
Zfa AMPHIBOLITE, MAGNETITE RICH BIOTITE SCHIST, QUARTZOSE SCHIST, AND MARBLE. HETEROGENEOUS UNIT OF VARIABLY COLORED, GRAY TO GREEN, FINE TO COARSE GRAINED, GARNET HORNBLENDE AMPHIBOLITE, MAGNETITE BEARING BIOTITE SCHIST, COARSELY CRYSTALLINE MARBLE, AND LIGHT GRAY, MICA-RICH QUARTZITE.
NOTES:
1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).
500 0 500 1000 FEET
1"=500' AT FULL SIZE (ANSI D)
1"=1000' AT HALF SIZE (ANSI B)
PROJECT
FORT KNOX PROJECT
FISH CREEK EAST WASTE ROCK DUMP
TITLE
GEOLOGIC MAP
CLIENT
FAIRBANKS GOLD MINING, INC.
Knight Piésold
CONSULTING
DESIGNED BY PD
DRAWN BY CB
ACTIVITY CODE N/A
LOCATION DV101
XREF NUMBER N/A
PROJECT NUMBER 00336.08
FIGURE NUMBER 2.1
REVISION 0


Property Line
Existing Phase 8 Pit Crest
East Wall Expansion
Pit Bottom: 430 AMSL
Powder Magazine
Eastern Pit Crest: 2060 AMSL
N
W
E
S
Phase 8 East Wall Expansion
Date: 10-18-17
KINROSS
Fort Knox
Author: TMT

Knight Piésold
CONSULTING

ISO 9001 - FS 585661
ISO 14001 - EMS 585662
OHSAS 18001 - OHS 585663

Fairbanks Gold Mining, Inc.
Fort Knox Project
Fish Creek East Waste Rock Dump
Report on Geotechnical Evaluation of
Dump Construction Over Existing Tailing

September 29, 2017

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KP Project No. DV101-00336/08

Rev. No.	Date	Description	Knight Piésold	Client
0	September 29, 2017	Issued as Final	Tom Kerr	Craig Natrop

Knight Piésold
CONSULTING

Fairbanks Gold Mining, Inc.
Fort Knox Project
Fish Creek East Waste Rock Dump
Report on Geotechnical Evaluation of
Dump Construction Over Existing Tailing

Executive Summary

At present, Fort Knox maintains and operates the Yellow Pup waste rock dump (WRD) that resides along the ridge comprising the north side of the Yellow Pup Creek valley just southeast of the Fort Knox open pit. On-going exploration efforts have identified a zone of ore within the ridge underlying the existing Yellow Pup dump, and Fairbanks Gold Mining, Inc. (FGMI) is evaluating the economic viability of remining some of the mine waste rock to provide access to the potential Yellow Pup pit.

While the Yellow Pup pit is being developed and mined, FGMI will need an alternative repository for waste rock. FGMI has proposed the development of a new waste rock dump on the north side of the Pearl Creek causeway within the tailing storage facility (TSF) north basin called the Fish Creek East WRD. The new proposed dump consists of two distinct areas including a large, pyramidal zone and a narrow, cross valley zone. Regardless of the decision to mine the Yellow Pup pit, additional mine waste capacity will be needed for operations in the Fort Knox pit. One of the other purposes of the proposed cross valley zone is to offer the potential to continue to deposit tailing slurry in the north basin from the west toward the dump.

Knight Piésold and Co. (Knight Piésold) has been tasked with completing the necessary geotechnical investigations and engineering analysis of the proposed layout of Fish Creek East WRD. This included (1) a site investigation program including cone penetration testing (CPT) and sonic drilling and sampling, (2) a limited laboratory testing program that focused on evaluating tailing types and density in the proposed dump foundation such that these materials could be compared to material tested from elsewhere in the TSF, and (3) a geotechnical analysis program that included limit equilibrium slope stability and finite difference earthquake-induced deformation analyses.

During the period from February 28, 2017 through March 10, 2017, the geotechnical site investigation was completed comprising CPT and sonic drilling with direct sampling of tailing material impounded within the TSF. This program consisted of nine locations where CPTs were advanced and adjacent sonic drill holes were also advanced for the purpose of sample collection. A subset of samples were sent to the Knight Piésold geotechnical laboratory in Denver for index and moisture content testing. In general, it was found that the tailing in the vicinity of the Fish Creek East waste rock dump characterized in a similar way to the coarse grained tailing located in the vicinity of the Yellow Pup waste rock dump; however, numerous layers of uncharacteristically stiff material were identified within the deposit in this area. These layers were often overlain and underlain by softer layers similar to what has been identified elsewhere within the facility. Substantial zones of excess pore pressures (in excess of hydrostatic conditions) were also identified during the current site investigation. This finding viewed in conjunction with the finding of stiff layers within the deposit indicated that there may be semi-continuous layers of frozen tailing buried within the deposit in the vicinity of the Fish Creek East WRD. These stiff zones were generally not taken into account for subsequent geotechnical engineering analyses because it is possible that these layers will not remain frozen in the future. The excess pore pressures identified due to the existence of the frozen layers were taken into account.

Geotechnical material properties were developed for the tailing, mine waste rock and bedrock foundation based on a combination of: (1) current site investigation and laboratory testing and site investigation data, (2) historic laboratory testing and site investigation data, and (3) literature values and experience with similar materials. Unit weights and failure criterions were developed for limit equilibrium slope stability

analyses. Stress-strain relationships were also developed for the earthquake-induced deformation analyses.

Limit equilibrium slope stability analyses were performed on the critical sections for both the pyramidal and cross valley portions of the WRD. The slope stability analyses were conducted under static, post-construction, and post-earthquake loading conditions. Appropriate undrained shear strength parameters were utilized for the tailing under post-construction and post-earthquake slope stability analyses. It was assumed that the mine waste rock and foundation bedrock would not lose strength due to undrained loading due to the nature of those materials. Static and post-construction factors of safety were shown to meet applicable minimum acceptable factors of safety for all of the cases considered. Post-earthquake stability analyses indicated factors of safety of less than 1.0 upon the occurrence of the maximum design earthquake (MDE). It must be understood that such results do not necessarily indicate unacceptable performance of the facility but rather that some permanent earthquake-induced deformations of the slope are anticipated. Acceptable performance is then based on the estimated magnitude and anticipated consequence of such movements. As such, finite-difference earthquake-induced deformation analyses were performed to quantify those anticipated movements.

The earthquake-induced deformation analyses were performed at the full build-out configurations on the critical sections for the pyramidal and cross valley portions of the WRD. The models were first built up in stages to achieve an accurate representation of the in-situ total and effective stresses prior to earthquake shaking. Each model was then subject to the loading associated with the occurrence of the MDE. Three separate acceleration time histories were utilized as recommended in the seismic hazard assessment developed for the Fort Knox site.

The results of the earthquake-induced deformation analyses show a maximum settlement observed within the pyramidal portion and cross valley portion of the waste rock dump of approximately 4 feet and 10 feet, respectively. Horizontal displacements observed within the pyramidal portion and cross valley portion of the waste rock dump are approximately 4 feet and 17 feet, respectively. The displacement histories recorded during earthquake loading indicate a gradual increase in the displacements that stop shortly after shaking. These displacements, while significant, are not likely to impact the operation, capacity or freeboard of the TSF and are considered acceptable for this type of facility.

The results of the geotechnical engineering analyses indicate that the performance of the proposed configurations of the pyramidal and cross valley portions of the WRD should be acceptable provided that the conditions modeled are representative of those in the field; however, due to the variation in site conditions observed in the vicinity of the proposed WRD compared with what has been observed elsewhere, there is additional uncertainty regarding the anticipated behavior of the tailing deposit in this location with respect to the propensity for pore pressure dissipation during construction or following an earthquake event. Because of this, FGMI should pay close attention to the performance of the slope faces during construction. To maintain a safe working environment, frequent inspections of the advancing face and emplaced mine waste rock should be made. Consideration should be given to any signs of distress (e.g., tension cracking parallel to the advancing face, bulging of the slope above the toe, water or tailing ejected on the surface of the mine waste rock fill, etc.) before work proceeds in that vicinity. Once the initial lift of mine waste rock is in place, it is strongly recommended that vibrating wire piezometers be installed via drill holes through the mine waste rock into the underlying tailing to monitor excess pore pressures induced by ongoing construction, which could be indicative of a pending undrained failure. It is possible that pore pressures will take longer to dissipate in this area due to the layers of frozen tailing indicated by the site investigation program. Installation of the piezometers should allow for optimized sequencing of mine waste rock placement to reduce the risk of undrained slope failure during construction. It would also be advisable to install survey monuments to monitor settlement and horizontal movement near and along the slope of the WRD.

Fairbanks Gold Mining, Inc.
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Appendices

Fairbanks Gold Mining, Inc.
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Section 1.0 - Introduction

1.1 Project Understanding

At present, Fort Knox maintains and operates the Yellow Pup waste rock dump (WRD) that resides along the ridge comprising the north side of the Yellow Pup Creek valley just southeast of the Fort Knox open pit. The dump consists of waste rock from mining operations within the Fort Knox open pit that has been truck-hauled and end-dumped over angle of repose slopes on the order of 300 feet high. The Yellow Pup dump originally had been founded on native ground, but it has recently extended partly over tailing in the Yellow Pup Creek valley, i.e., part of the TSF south basin. On-going exploration efforts have identified a zone of ore within the ridge underlying the existing Yellow Pup dump. Fairbanks Gold Mining, Inc. (FGMI) is currently evaluating the economic viability of remining some of the waste rock to provide access to the potential Yellow Pup pit. Given the variation in market conditions since the start of operations at Fort Knox, it is expected that some of the remined material may meet the current cut-off grade and, thus, would be moved onto the Walter Creek heap leach facility (WCHLF) or the proposed Barnes Creek heap leach facility (BCHLF) for processing.

While the Yellow Pup pit is being developed and mined, FGMI will need an alternative repository for waste rock to include uneconomic material remined from the Yellow Pup waste rock dump, waste rock from development of the Yellow Pup pit and waste rock from continuing operations in the Fort Knox pit. Consequently, FGMI has proposed the development of a new waste rock dump on the north side of the Pearl Creek causeway within the TSF north basin. The new dump consists of two distinct areas including a large, pyramidal zone on the order of 400 to 450 feet high that is proposed to be constructed near the current Fish Creek East area. In addition, a narrow, cross valley zone approximately 75-feet high is planned across the Fish Creek valley. The configuration of the proposed WRD is shown in plan view on Figure 1.1. Cross sections A and B, which were selected for geotechnical modeling are presented on Figure 1.2.

Regardless of the decision to mine the Yellow Pup pit, additional mine waste rock capacity will be needed for operations in the Fort Knox pit. One of the other purposes of the proposed cross valley zone is to offer the potential to continue to deposit tailing slurry in the north basin from the west toward the dump. Tailing solids would be captured behind the dump with the supernatant water flowing through the waste rock to the north pond beyond the dump for recovery to the mill. This configuration may allow tailing to be stacked higher in the westernmost part of the north basin with an overall increase in the remaining TSF capacity despite losing some volume intended for tailing to the base of the cross valley dump.

In accordance with the proposal dated February 15, 2017, Knight Piésold and Co. (Knight Piésold) has completed the necessary geotechnical investigations and engineering analysis of the proposed layout of Fish Creek East waste rock dump, which has been developed by jointly with FGMI, to assess its expected performance under a range of operating conditions. This work, as presented in the report that follows, included the following:

- Perform a site investigation to evaluate the in-situ conditions and engineering properties of the tailing upon which the Fish Creek East WRD would be founded. This included a cone penetration testing (CPT) program with associated drilling to obtain tailing samples. A subset of these samples was then tested in the Knight Piésold geotechnical laboratory in Denver, Colorado to evaluate some of the geotechnical properties of the tailing.

- Complete engineering analyses to demonstrate the technical viability of the proposed WRD that comprises placement of mine waste rock over previously deposited tailing. Analyses include limit equilibrium slope stability analyses under static, post-construction and post-earthquake loading conditions; and two-dimensional earthquake-induced deformation analyses which included two-dimensional site response and liquefaction evaluations.

1.2 Limitations and Disclaimer

This report titled *Fish Creek East Waste Rock Dump - Report on Geotechnical Evaluation of Dump Construction Over Existing Tailing* has been prepared by Knight Piésold for the exclusive use of Fairbanks Gold Mining, Inc. (FGMI). No other party is an intended beneficiary of this report or the information, opinions, and conclusions contained herein. Any use by any party other than FGMI, except for the purpose of regulatory review and approval, of any of the information, opinions, or conclusions is the sole responsibility of said party. The use of this report shall be at the sole risk of the user regardless of any fault or negligence of FGMI or Knight Piésold.

The information and analyses contained herein have been completed to a level of detail commensurate with the objectives of the assignment and in light of the information made available to Knight Piésold and Co. (Knight Piésold) at the time of preparation. This report and its supporting documentation have been reviewed and/or checked for conformance with industry-accepted norms and applicable government regulations. Calculations and computer simulations have been checked and verified for reasonableness, and the content of the report has been reviewed for completeness, accuracy, and appropriateness of conclusions. To the best of the information and belief of Knight Piésold, the information presented in this report is accurate to within the limitations specified herein.

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CONSULTING

Section 2.0 - Site Conditions

2.1 Geology

Geologic mapping of the Fairbanks Mining District at a scale of 1:63,360 is available from the Alaska Division of Geological and Geophysical Surveys (Alaska DGGS), and that mapping (Alaska DGGS, 1996) in the general area of the proposed Fish Creek East WRD is incorporated into Figure 2.1. Additional surficial geologic mapping within the vicinity of the WRD is limited by sparse bedrock outcrops due to deep weathering of the bedrock and dense vegetative cover. The geologic units underlying the project area comprise a layer of alluvium underlain by Fairbanks Schist. This area is further described as the Cleary Sequence in some past reports and maps; however, current geologic mapping of this area incorporates the Cleary Sequence into the Fairbanks Schist. The Fairbanks Schist includes a wide variety of metamorphic rocks including quartz muscovite schist, quartzite, quartzite grit, marble, chlorite schist, amphibolite, and magnetite-rich biotite schist. The Fairbanks Schist is composed of nearly 90 percent quartzite and quartz muscovite schist. The dominant rock types encountered during previous site investigations include well foliated, highly fractured, quartz muscovite schist (Zf) and highly fractured quartzose schist (Zfa). The site metamorphic rocks range in age from late Precambrian to early Paleozoic. The degree of weathering of the rockmass varies significantly with depth. Generally, the site consists of a thin layer of transported alluvium or residual soil and highly weathered to moderately weathered schist formation. The degree of weathering generally decreases with depth across the project site.

2.2 Seismicity

In support of work to assess liquefaction and the effects of seismic loading (i.e., evaluation of permanent earthquake-induced deformations), an understanding of potential seismic activity was required. Previously, for the design of the Fort Knox TSF expansion from crest elevation 1488 fmsl to 1540 fmsl, Knight Piésold reviewed available literature and a probabilistic and deterministic evaluation of potential seismic activity at the site (Knight Piésold, 2011). This study, which is included in Appendix A, concluded that the maximum credible earthquake (MCE) for the Fort Knox mine is generated from the Fairbanks seismogenic source zone and comprises a shallow crustal event (strike-slip) of magnitude M=6-1/2 at an assumed distance of 3 miles from the site that would produce a peak horizontal ground acceleration (PHGA) of 0.63g. Minor updates have been made to the aforementioned seismic hazard assessment as part of the work performed in support of the expansion of the TSF to crest elevation 1557.0 fmsl (Knight Piésold, 2016). This update does not materially affect the magnitude and peak ground acceleration of the design event, but does provide updates to the time histories, which have been spectrally matched to the anticipated design spectra. This update is also provided in Appendix A.

Given that the proposed WRD will encroach into the footprint of the Fort Knox TSF, similar design criteria have been considered. These include the maximum design earthquake (MDE), i.e., a larger event that the facility must withstand without catastrophic failure, and the operating basis earthquake (OBE), i.e., a more moderate event that the facility must withstand while remaining operable. To date, the MCE has been considered to be the MDE, and a 1,000-year recurrence interval event has been considered as the OBE. That precedent has been maintained through this work as well. The updated site seismic hazard review (located in Appendix A) recommends three spectrally matched earthquake time histories for the MDE (MCE) for subsequent liquefaction and deformation analyses. These records have been utilized in the earthquake-induced deformation analyses presented in Section 3.6.

Section 3.0 - Geotechnical Evaluations

As described in the sections that follow, geotechnical evaluations of the Fish Creek East WRD include site investigations; laboratory testing; evaluation of material properties, limit-equilibrium slope stability and finite difference earthquake-induced deformation analyses, which incorporated an assessment of tailing liquefaction potential.

3.1 Geotechnical Site Investigations

During the period from February 28, 2017 through March 10, 2017, a geotechnical site investigation was completed comprising CPT and sonic drilling with direct sampling of tailing material impounded within the Fort Knox TSF. Drilling and CPT services were provided by ConeTec, Inc. of Vancouver, British Colombia. Oversight and field engineering were provided by Denver-based Knight Piésold staff. The program included nine CPT probe locations with drilling and sampling completed immediately adjacent to each CPT location. The nine CPT locations are shown in plan view on Figure 1.1.

Prior to this investigation during the design of the TSF expansion, considerable data were generated regarding the engineering behavior of the foundation materials in the vicinity of the TSF embankment and the impounded tailing within the facility (Knight Piésold, 2011 and Knight Piésold, 2016). Given that the foundation materials comprised a thin veneer over weathered bedrock at substantial depth beneath the impounded tailing, further investigation of this material was not deemed necessary. This site investigation was then generally focused on evaluation of the tailing adjacent to the Fish Creek East WRD. This was done to assess whether those materials were sufficiently similar to those identified during previous work completed for design of the TSF embankment (Knight Piésold, 2011 and 2016) or the Yellow Pup waste rock dump (Knight Piésold, 2013) such that existing material properties could be utilized in subsequent analyses or supplemented with the more recent data.

In advance of the site investigation, FGMI provided an access road to the CPT locations over the frozen tailing beach suitable for truck-mounted equipment. CPT probing was completed with use of a portable hydraulic ram and instrumentation that was mounted on the sonic drilling rig and, thus, employed the weight of the rig as the necessary reaction force and relied on the drill rig hydraulic systems for power. The site investigation was predominately comprised of conventional CPT probes with measurement of tip resistance, sleeve friction and penetration pore pressures. In addition to data collected while advancing the CPT probe, probe advance was periodically interrupted to conduct pore pressure dissipation (PPD) tests. The PPD tests targeted sandier layers in the tailing, because the investigation sought to characterize the static pore pressure distribution within the tailing, rather than trying to characterize the permeability and/or coefficient of consolidation of the tailing, so faster dissipation in sandier layers expedited the program. In addition, each CPT probe was conducted as a seismic cone, i.e., shear wave (s-wave) velocity profiles were established for use in characterizing the small strain shear modulus of the material. Data from the CPT program are included in Appendix B.

In general, it was found that the tailing in the vicinity of the Fish Creek East waste rock dump was similar to the more coarsely-grained tailing located in the vicinity of the Yellow Pup waste rock dump. Although the CPT identified somewhat finer-grained zones, which did correlate with somewhat higher fines contents in the laboratory testing, in general the laboratory testing confirmed relatively coarser tailing in this area, similar to the coarser material identified in the vicinity of the Yellow Pup WRD. Pore pressure conditions, however, varied considerably from prior investigations performed elsewhere in the tailing basin. Specifically, numerous layers of uncharacteristically stiff material were identified within the deposit in the vicinity of the Fish Creek East WRD with elevated, i.e., in excess of hydrostatic pore pressure between them. These layers were characterized by abnormally high tip resistances, low sleeve friction and high shear wave velocities compared with other CPT investigations within the TSF basin. These layers were often overlain and underlain by softer layers similar to what has been identified elsewhere within the facility. Substantial zones of excess pore pressures were also identified between the stiff layers during the current site investigation, where largely hydrostatic conditions were identified elsewhere in the facility during prior investigations. This indicates that the rate of tailing consolidation is not keeping up with the rate of tailing deposition in those layers. These findings indicate that there may be semi-continuous layers of frozen tailing buried within the deposit in the vicinity of the Fish Creek East WRD. Such frozen layers would explain the zones of high tip resistance and impeded drainage resulting in excess pore pressures, since semi-continuous frozen layers would be expected to exhibit low hydraulic conductivity and slow the consolidation process.

3.2 Geotechnical Laboratory Testing

After their receipt from the field, sonic drilling samples were inventoried, and specific testing was assigned. Testing of tailing samples was completed at the Knight Piésold geotechnical laboratory in Denver, Colorado. Testing on the tailing included index testing, (i.e., sieve, hydrometer and Atterberg limits) natural moisture content testing and specific gravity testing on samples representing a range of locations, depths and material types as initially indicated from CPT normalized soil behavior type (SBTn) distributions. The purpose of this limited testing program was to provide a direct material type comparison between the material types identified in the vicinity of the Fish Creek East WRD and the tailing from other locations, which has been tested extensively in support of the design of the TSF embankment and the Yellow Pup WRD.

3.2.1 Index Testing

Sieve and hydrometer analyses (ASTM D 422) were conducted on a total of 22 samples collected at depth during the drilling operations. Atterberg limits (ASTM D 4318) were also run on the 22 samples. The combination of these index tests allowed the soil to be classified (ASTM D 2487) according to the Unified Soil Classification System (USCS), which is commonly used to group soils that exhibit similar engineering properties and behavior. Index testing of the tailing is included in Appendix C-1, and the results are summarized in Table 3.1. Gradations are illustrated on Figure 3.1. Also shown on Figure 3.1 are the gradations of the “coarser” and “finer” bulk samples subject to advanced geotechnical testing in support of the design of the Yellow Pup WRD (Knight Piésold, 2013). It can be seen on the figure that the recent samples tested generally group around the “coarser” bulk gradation from the Yellow Pup WRD laboratory testing program. Based on this observation, the advanced laboratory testing previously performed on the “coarser” tailing sample from Yellow Pup has been deemed to be representative of the tailing deposit near the Fish Creek East WRD. Because no clear delineation between coarser and finer tailings was observed in the laboratory testing presented herein, it was deemed appropriate to model the tailings mass upon which the Fish Creek East WRD is founded upon as a uniform material in the analyses presented in Section 3.5 and 3.6 of this report.

3.2.2 Natural Moisture Content and Specific Gravity Testing

Since it is generally extremely difficult, if not practically infeasible, to recover undisturbed samples of tailing as fine-grained and soft as those encountered within the TSF basin, the moisture content and specific gravity data from the disturbed samples were used to calculate in-situ dry densities assuming that the material was saturated in lieu of measuring unit weight directly from undisturbed samples. It should be noted that there was evidence that most of the small disturbed samples experienced water loss during shipping as free water was found standing in the buckets after receipt in the Denver laboratory. Because of this, the samples shipped in each bucket were bulked with the total water in the bucket and within the bagged samples for the testing described in this section. Natural moisture content (ASTM D 2216) and specific gravity (ASTM C 127 and/or D 854) were measured for each of the 22 buckets shipped to provide average in-situ dry densities over the depth intervals within each bucket. Detailed results of the laboratory testing are contained in Appendices C-2 and C-3 with a summary presented in Table 3.2. Figure 3.2 illustrates the profile of calculated dry unit weight with average depth for each testing interval. Median dry and saturated unit weights of 83.2 pcf and 115.0 pcf, respectively, were selected as representative unit weights for the subsequent engineering analyses presented herein.

3.3 Pore Water Pressure Conditions

Pore pressure distributions were estimated at each of the nine CPT probe locations using PPD test results. The PPD data has been included in the ConeTec report in Appendix B. It is of note that many of the PPD tests were not run to completion due to time constraints. As such, the PPD tests were extrapolated using the methodology described by Scheremeta (2014). The extrapolated equilibrium pore water pressure values were used to develop pore water pressure profiles for each CPT probe as shown on Figures 3.3 through 3.11. These plots illustrate the estimated equilibrium pore pressure values with depth (as blue circles) for each CPT location, along with straight-line interpolations between the data. A hydrostatic line is also provided on the plots for reference. The hydrostatic pressure is equal to zero at the estimated phreatic surface. Hydrostatic pore pressure represents the pressure that is equal to the weight of water times the depth of the water, and this condition is associated with no flow or movement of water and no excess pressure caused by an undrained increase in total stress.

The results of the pore water pressure assessment indicate that the phreatic surface is generally close to the surface of the tailing in areas of the deposit that will underlie the Fish Creek East WRD as anticipated. Pore water pressures in excess of hydrostatic conditions were, however, observed below the phreatic surface at the majority of the CPT locations except at CPT-32 which was advanced remote to the WRD in the vicinity of the Pearl Creek Causeway. This indicates that there are likely zones of underconsolidated tailings in the Fish Creek East area. In other parts of the TSF, largely hydrostatic pore water pressures have typically been observed during prior investigations, indicating that the rate of consolidation has generally kept up with the rate of tailing deposition. In the vicinity of the Fish Creek East WRD, it is hypothesized that lenses of frozen tailings are existent. These frozen lenses likely have lengthened consolidation flow paths, thereby increasing the time required for consolidation to occur under the weight of the deposited tailing.

Figure 3.12 presents a summary of observed pore water pressures at the nine CPT probes completed in the Fish Creek East area with respect to the depth below the interpreted phreatic surface. Three additional lines are also presented on the plots representing conditions equal to 100%, 120% and 150% of hydrostatic. Based on a review of this information and engineering judgment, a representative pore pressure profile corresponding to 120% of hydrostatic was selected for subsequent two-dimensional geotechnical engineering analyses. It is anticipated that these excess pore pressures will continue to decrease towards the hydrostatic line with time as the consolidation process continues; However, pressures may increase again under the weight of the WRD construction and additional tailing deposition. Because of the observed underconsolidated zones in this area, it is highly recommended that a suite of piezometers be installed in the tailing below the base of the proposed dump such that pore pressures can be monitored during construction and operation of the facility to reduce risk of large deformations due to undrained loading by allowing the rate of construction to be regulated to limit the development of excess pore pressures in the tailing.

3.4 Geotechnical Material Properties

3.4.1 Material Type Identification

Three material types have been identified as those that are relevant for subsequent geotechnical engineering analyses. These include:

- Tailing
- Mine Waste Rock
- Bedrock Foundation

As described in the sections that follow, representative material properties for each of these material types were selected based on in-situ and laboratory testing, observed field performance, published literature values, and engineering judgment. General properties of interest include: unit weight, moisture content, and shear strength under static, post-construction and post-earthquake loading conditions. Stress-strain relationships were also required for earthquake-induced deformation analyses. The selected values for limit equilibrium slope stability analyses are summarized in Table 3.3. Additional information was required for the earthquake-induced deformation analyses; this is summarized in Table 3.4. An explanation of the development of the material properties is provided in the report sections that follow.

3.4.2 Tailing

3.4.2.1 Tailing Occurrence

The majority of the foundation that will underlie the proposed Fish Creek East WRD consists of hydraulically deposited tailing. Segregation of the tailing deposited in the Fort Knox TSF into finer and coarser fractions has typically been observed during prior investigations elsewhere in the tailing deposit. This was typically confirmed by two distinct bands of coarser and finer tailing on the grain size distribution plots; However, although there was some variation in fines content and corresponding variations in SBTn calculated from the CPT data, the tailings in the Fish Creek East area generally forms a single grain size distribution band as can be seen in the results presented on Figure 3.1. This band indicates that the tailing in the vicinity of the Fish Creek East WRD is similar to the coarser material observed in the vicinity of the Yellow Pup WRD, which has undergone extensive laboratory testing. As such, the laboratory testing performed on that material has been utilized in conjunction with the CPT and laboratory test data collected during this investigation to develop material properties for the tailing underlying the proposed Fish Creek East WRD.

3.4.2.2 Tailing Unit Weight and Moisture Content

Measured saturated moisture contents and specific gravities were used to calculate dry and saturated unit weights for each bucket of bagged samples from a range of depths at one of the CPT locations. As noted above, leakage of the bagged samples prevented the measurement of saturated and dry densities for individual samples. The following equations were used to calculate density assuming the material was saturated.

$$\gamma_{dry}=G_s*\gamma_w/(w_{sat}*G_s+1)$$

where: γ_{dry} - dry unit weight
G_s - specific gravity
γ_w - unit weight of water
w_{sat} - moisture content at saturation

$$\gamma_{sat}=\gamma_w+\gamma_{dry}*(1-1/G_s)$$

where: γ_{sat} - saturated unit weight:
γ_w - unit weight of water
γ_{dry} - dry unit weight
G_s - specific gravity

A profile of calculated dry unit weights with depth is presented on Figure 3.2. This data is tabulated on Table 3.2. As shown on the figure, the dry unit weights do not vary substantially with depth. Calculated dry unit weights ranged from 53.4 to 104.3 pounds per cubic foot (pcf), while saturated unit weights varied from 96.2 to 128.2 pcf. Recommended dry and saturated unit weights for subsequent analyses correspond with median values of 83.2 and 115.0 pcf, respectively.

3.4.2.3 Tailing Shear Strength

A number of different representations of the tailing shear strength under various loading scenarios were required for completion of the various geotechnical engineering analyses presented in Sections 3.5 and 3.6 of this report. The limit-equilibrium slope stability analyses presented in Section 3.5 required a representation of: (1) the peak friction angle for long-term drained effective stress slope stability analyses, i.e., the maximum friction angle that can be mobilized, (2) a variation in peak undrained shear strength with effective confining stress after consolidation for post-construction slope stability analyses, and (3) a variation in residual undrained shear strength with effective confining stress after consolidation for post-earthquake slope stability analyses. The earthquake-induced deformation analyses presented in Section 3.6 required the peak friction angle and the constant volume (or critical state) friction angle. The peak friction angle is typically a representation of the drained shear strength at maximum obliquity (or peak principal effective stress ratio), while the constant volume friction angle is a representation of the drained shear strength at large strain. The peak friction angle is generally a function of material density, while the constant volume friction angle is an intrinsic property of the material.

3.4.2.3.1 Peak/Constant Volume Friction Angles and $(N_1)_{60}$

The Mohr-Coulomb failure criterion used for: (1) limit-equilibrium slope stability analyses and (2) the Mohr-Coulomb and UBCSand constitutive models within the earthquake-induced deformation analyses require properties that establish material shear strengths as a function of effective confining stress. This is most simply described by a generalized effective stress friction angle; however, effective friction angles can be interpreted in a variety of ways from a given laboratory and in-situ testing dataset.

The Mohr-Coulomb constitutive model requires a single effective stress friction angle, while the UBCSand model requires both “peak” and “critical state” friction angles. In general, peak friction angles taken at maximum obliquity (i.e., the maximum ratio of major principal stress to minor principal stress) from consolidated-undrained (CU) triaxial tests are appropriate for use as a Mohr-Coulomb strength criterion if the user is confident that the loading conditions and material density exhibited in the laboratory are similar to the conditions anticipated in the field. Critical state (i.e., “constant volume”) friction angles correspond to the point at which increasing strain does not result in additional tendency for volume change. Critical state friction angles are usually mobilized at larger strains than those which can typically be achieved in a triaxial shear strength test. Note that friction angles are sometimes interpreted at the maximum deviator stress achieved during the CU test, which is typically somewhere between the peak friction angle at maximum obliquity and the critical state friction angle. The friction angle at peak deviator stress should not be misunderstood to represent a critical state (constant volume) friction angle, because the test is usually terminated prior to reaching critical state.

For materials that may exist at lower densities in the field than those which can easily be achieved in the laboratory, such as hydraulically placed tailing, the peak friction angle taken from triaxial shear strength testing may be somewhat higher (i.e., non-conservative) than the value that may be anticipated in the field. This is because the material in the laboratory may have a tendency to dilate more so than the material would dilate in the field. Because of this potential difference, Beaty and Byrne (2011) recommend using an empirically-derived correlation incorporating in-situ test data (i.e., equivalent normalized SPT blow counts) to estimate the peak friction angle for loose and potentially liquefiable material.

Knight Piésold has previously performed a set of three isotropically-consolidated undrained (ICU) triaxial shear strength tests on each of the coarser and finer tailing samples representative of the materials existent in the vicinity of the Yellow Pup WRD. As previously mentioned, the coarser tailing at the Yellow Pup WRD is generally representative of the tailing deposit in the vicinity of the proposed Fish Creek East WRD. The results of the triaxial testing for the coarser tailing at the Yellow Pup WRD are summarized on Figure 3.13.

As previously noted, directly establishing a constant-volume friction angle from a CU triaxial shear strength test is difficult because these tests can only be run to approximately 20 percent strain, and larger strain levels are typically required to reach critical state; however, critical state friction angle is known to be an intrinsic property of the soil being tested, i.e., variations in sample density and loading conditions do not affect this property like the peak friction angle is affected by these conditions. Negussey, et al. (1987) performed a series of triaxial and ring shear tests on loose, sandy material and concluded that the phase transformation friction angle from a CU triaxial test on an initially contractive specimen is generally a good approximation of the critical state or constant volume friction angle. Phase transformation refers to the point on a stress path where phase change between contractive to dilative behavior occurs.

The interpretation of the ICU triaxial test data shown on Figure 3.13 show the friction angle established at the point of phase transformation. The value noted on the figure, i.e., 33.5 degrees has been adopted as the constant volume friction angle for input into the UBCSand constitutive model.

A representative equivalent normalized SPT value, i.e., $(N_1)_{60}$, was derived for the tailing based on correlations with CPT test results. To do this, the CPT data were first used to develop cyclic resistance ratios, i.e., $CRR_{7.5}$, using the computer software Cliq (Geologismiki, 2006). Data indicating abnormally high $CRR_{7.5}$ values was removed from the dataset because this data likely was indicative of frozen layers of tailing in the deposit. Figure 3.14 shows the complete $CRR_{7.5}$ dataset prior to removal of the data from abnormally stiff layers. Figure 3.15 shows the dataset after removal of the data from those layers. The recommended $CRR_{7.5}$ of 0.09 was taken as the average of the data shown on the latter figure and is shown on the plot. Based on recommendations from Dr. Michael Beaty (who was one of the developers of UBCSand), the $(N_1)_{60}$ value for the tailing presented on Table 3.4 was back-calculated from the average $CRR_{7.5}$ value interpreted from the CPT data using equations recommended by Youd et al., (2001). Based on this approach, a representative $(N_1)_{60}$ value of 8.1 for the tailing was selected.

Using the representative $(N_1)_{60}$ value, the peak friction angle was estimated using the method recommended by Beaty and Byrne (2011), as follows:

$$\phi'_p = \phi'_{cv} + (N_1)_{60}/10$$

where: ϕ'_p - the peak friction angle
ϕ'_{cv} - the constant volume or critical state friction angle
$(N_1)_{60}$ - representative normalized SPT blow count.

Based on this process, a representative peak friction angle of 34.3 degrees was established for the tailing in the Fish Creek East area. This peak friction angle was also used to establish the Mohr-Coulomb failure criterion for completion of static limit equilibrium slope stability analyses.

3.4.2.3.2 Peak and Residual Undrained Shear Strength

Representative peak and residual undrained shear strength ratios for the tailing were established using available CPT data from the Fish Creek East investigation. Work by Olsen and Stark (2002 and 2003) define the undrained shear strength of strain softening materials at yield and at steady state based on correlations between normalized CPT tip resistance and undrained shear strength ratio. To correlate the CPT data with undrained strength ratio, it was necessary to first normalize the measured tip resistance to an effective confining stress of one atmosphere as shown below:

$$q_{c1} = q_c * 1.8/(0.8 + \sigma'/p_{atm})$$

where: q_{c1} - tip resistance normalized to one atmosphere
q_c - measured CPT tip resistance
σ' - effective overburden stress where measurement taken
p_{atm} - atmospheric pressure in compatible units

The normalized tip resistance values were then correlated with yield undrained strength ratio as shown below:

$$S_u(\text{yield})/\sigma'_{vo} = 0.205 + 0.0143 * q_{c1} \pm 0.04 \text{ for } q_{c1} \leq 6.5 \text{ megapascals (MPa)}$$

where: S_u(yield) - yield undrained shear strength
σ'_{vo} - initial vertical effective overburden stress
q_{c1} - tip resistance normalized to one atmosphere in MPa

The normalized tip resistance values were then also correlated with liquefied undrained strength ratio as shown below:

$$S_u(\text{liq})/\sigma'_{vo} = 0.030 + 0.0143 * q_{c1} \pm 0.03 \text{ for } q_{c1} \leq 6.5 \text{ MPa}$$

where: S_u(liq) - liquefied undrained shear strength
σ'_{vo} - initial vertical effective overburden stress
q_{c1} - tip resistance normalized to one atmosphere in MPa

It is of note, that the above equations are only applicable to normalized tip resistance measurements below 6.5 MPa. Olson and Stark state that normalized tip resistance values higher than this indicate material that is not generally subject to undrained strength reduction upon shearing. The probes advanced in the Fish Creek East area did have extensive intervals of data that exceeded this threshold, but as previously noted, these intervals are likely indicative of frozen zones, rather than being indicative of stiff dilative material. As such, the data beyond this threshold was eliminated from the dataset, and the balance of the data was used to characterize the tailing in the Fish Creek East area.

The peak undrained shear strength ratio is applicable for slope stability analyses involving undrained behavior due to conditions such as rapid loading, e.g., post-construction conditions wherein fill was placed fast relative to the ability of the underlying material to dissipate the resultant excess pore pressure. Results and a recommended median value is presented on Figure 3.16. For the tailing in the vicinity of the Fish Creek East area, a S_u(yield)/ σ'_{vo} of 0.230 has been selected for subsequent post-construction slope stability analyses.

The liquefied undrained shear strength ratio is applicable to slope stability analyses involving slopes that comprise, in part, materials that have already strained past the yield surface to their residual, or steady state, shear strength. Such would be the case when assessing the stability of a slope following the occurrence of earthquake shaking significant enough to liquefy the material of interest. Results and a recommended median value is presented on Figure 3.17. For the tailing in the vicinity of the Fish Creek East area, a S_u(liq)/ σ'_{vo} of 0.055 has been selected for subsequent post-earthquake slope stability analyses.

3.4.2.4 Tailing Stress-Strain Relationships

The major stress-strain parameters required for implementing the UBCSand, constitutive model are the bulk modulus and shear modulus. The UBCSand model calculates these moduli as functions of the effective stress, using two “modulus numbers” that represent the bulk and shear modulus values normalized to atmospheric pressure. The moduli values in the FLAC model are then updated at each time step for each zone during the analysis as a function of effective stress. The more simplistic Mohr-Coulomb and Linear Elastic constitutive models use fixed (i.e., constant) values of moduli for the duration of the modelling. These moduli can be varied with depth.

Shear moduli for the tailings were developed using shear wave velocity measurements collected during the CPT program. Seismic shear wave velocity testing was generally performed at one-meter intervals when feasible. Testing was performed over larger intervals where drillouts were required. The data points on Figure 3.18 depict the variation in measured shear wave velocity with depth for the tailing in the vicinity of the proposed Fish Creek East WRD. In general, shear wave velocity is expected to increase with depth, with larger increases for a given stress increment at lower confining stresses. This was generally observed in the dataset received, except for numerous outliers that are thought to be the result of layers of frozen tailing. The outliers depicted on Figure 3.18 indicate much larger shear wave velocities than those that would be expected in a hydraulically placed tailing deposit and add further support to the hypothesis that frozen zones have skewed results. The outliers have been removed from the dataset on Figure 3.19. The curve shown on that figure comprises the calculated variation in shear wave velocity with depth that was developed as described below. Profiles of vertical effective confining stress with depth were first developed for tailing using the average calculated unit weight and an interpreted pore pressure profile equal to 120% of a hydrostatic condition. Then, profiles of mean effective confining stress were calculated as follows:

$$\sigma'_m=(\sigma'_v+2*K_o*\sigma'_v)/3$$

where: σ'_m - mean effective confining stress
σ'_v - vertical effective confining stress
$K_o \approx 1\text{-}\sin\phi'$ - at-rest lateral earth pressure coefficient

and profiles of maximum, i.e., small strain, shear modulus were calculated as follows:

$$G_{max} = 22 \cdot K_{2,max} \cdot (\sigma'_m \cdot p_{atm})^{0.5}$$

where: $K_{2,max}$ - shear modulus number
p_{atm} - atmospheric pressure in compatible units

and profiles of shear wave velocity were calculated as follows:

$$V_s = (G_{max}/\rho_{sat})^{0.5} = (G_{max}/(\gamma_{sat}/g))^{0.5}$$

where: ρ_{sat} - saturated density
γ_{sat} - saturated unit weight
g - acceleration due to gravity

A visual fit was then completed by varying $K_{2,max}$ for the tailings until the calculated curve provided a reasonable approximation of the available shear wave velocity data. The resulting $K_{2,max}$ value was 26 as shown on Figure 3.19. The shear modulus number k_g for the UBCSand constitutive model is the shear modulus calculated using the above equation at a mean effective stress of one atmosphere divided by atmospheric pressure. A shear modulus number of 572 was selected for the tailing for subsequent earthquake-induced deformation analyses.

Similar to the shear modulus number, the bulk modulus number is a normalized parameter equal to the bulk modulus at a mean effective stress of one atmosphere divided by atmospheric pressure. A Bulk modulus number of 763 was calculated for the tailing using the following equation:

$$K_b = K_g \cdot 2(1+\nu)/(3(1-2\nu))$$

where: $K_b = B/P_{atm}$ at mean effective stress of one atmosphere, i.e., $\sigma'_m = P_{atm}$,
ν = Poissons' ratio, which was assumed to be 0.2 for small-strain tailings behavior

Finally, an additional parameter, known as the plastic shear stiffness number, ie., K_{gp}, was also calculated based on $(N_1)_{60}$ using an equation suggested by Beaty (2011):

$$K_{gp} = K_g \cdot (N_1)_{60}^2 \cdot 0.003 + 100$$

3.4.3 Mine Waste Rock

Material properties for the mine waste rock had previously been established for limit equilibrium slope stability and FLAC deformation analyses performed in support of the design for the raise to the TSF from crest elevation 1540 fmsl to 1557 fmsl. Loose dumped mine waste rock had been utilized for construction of the base working platforms incorporated into the TSF embankment.

3.4.3.1 Mine Waste Rock Unit Weight and Moisture Content

FGMI utilizes a value of 16.88 cubic feet per ton to establish the required waste rock dump volumes elsewhere on site. This corresponds to a dry unit weight of 118.5 pcf that has been adopted for the design value. Given the average specific gravity and in-situ moisture content values, the moist and saturated unit weights were calculated as 123.6 and 136.7 pcf, respectively.

3.4.3.2 Mine Waste Rock Shear Strength

A peak effective stress friction angle (ϕ') of 36 degrees has been estimated for waste rock material under drained loading conditions from the angle of repose measured at several mine waste rock dumps around the Fort Knox site. The waste rock is not anticipated to lose significant strength upon occurrence of an earthquake due to its coarse gradation and low fines content.

3.4.3.3 Mine Waste Rock Stress-Strain Relationships

Similar to development of the stress-strain relationships for the tailing described above, a $K_{2,max}$ value was used to develop appropriate small strain shear moduli for the mine waste rock; however, different data were used to select the appropriate value for $K_{2,max}$ for the mine waste rock. Data from Peck, Hanson and Thornburn (1974) relate effective stress friction angle to SPT blow count. For the mine waste rock, a friction angle of 36 degrees results in an $(N_1)_{60}$ value of 30.

Seed et al. (1986) relate blow count to $K_{2,max}$ as follows:

$$K_{2,max} \approx F*20*(N_1)_{60}^{1/3}$$

where: $K_{2,max}$ - shear modulus number

$(N_1)_{60}$ - SPT blow count corrected to confining stress of one atmosphere and an energy ratio of 60 percent

F – modification factor, a value of 1.0 is recommended for sands, while a value of 1.35 to 2.50 is recommended for gravels. A factor of 1.35 was used for the mine waste rock because this material is loose dumped

This resulted in a calculated $K_{2,max}$ of 84. This value of $K_{2,max}$ was used with the equation presented in Section 3.4.2.4 to provide a variation between G_{max} and effective confining stress for input into the Mohr-Coulomb constitutive model. A profile of bulk modulus was calculated from shear modulus using the following equation:

$$B = G *2(1+\nu)/(3(1-2\nu))$$

where: B – bulk modulus
G – shear modulus
ν – poisson's ratio (calculated to be 0.292, see Table 3.4)

3.4.4 Bedrock Foundation

3.4.4.1 Bedrock Foundation Occurrence

The proposed Fish Creek East WRD and adjacent TSF basin is underlain by fractured schist bedrock.

3.4.4.2 Bedrock Foundation Unit Weight and Moisture Content

The unit weight of the schist bedrock was updated based on the density of samples collected during a 2015 site investigation program (Knight Piésold, 2016). Density measurements resulted in a saturated unit weight of 166.0 pcf. The dry unit weight of 165.6 pcf was calculated from the saturated unit weight and the specific gravity of 2.67.

3.4.4.3 Bedrock Foundation Shear Strength

The shear strength of the schist bedrock was updated based on the data collected during the 2015 TSF site investigation program (Knight Piésold, 2016). The shear strength versus normal stress relationship for the rock mass was developed in that report using the generalized Hoek-Brown criterion (Marinos and Hoek, 2002). The generalized Hoek-Brown criterion yields curvilinear shear strength envelopes that are considered effective representations of intact rock and jointed rock mass behavior. The generalized Hoek-Brown criterion includes primary and secondary Hoek-Brown parameters, which are presented in Table 3.3. It is of note that the limit-equilibrium slope stability analyses discussed in Section 3.5 utilized the Hoek-Brown failure criterion, however, a liner elastic model was used for the earthquake-induced deformation analyses, i.e., no failure criterion was assigned for those analyses. This was done for simplicity since the vast majority of permanent deformation is expected to take place in the tailing and overlying WRD and not in the underlying bedrock.

3.4.4.4 Bedrock Foundation Stress-Strain Relationships

As noted in Table 3.4, Young's modulus and Poisson's ratio values for the underlying fractured and weathered schist bedrock foundation were adopted from data presented by Krynine and Judd (1957). The shear modulus of the bedrock was calculated from those two values. Due to the rigid nature of the bedrock, shear and bulk moduli are assumed to be constant within the bedrock foundation, as opposed to within other materials modelled, where an increase in moduli with depth was assumed.

3.5 Slope Stability Analyses

3.5.1 Stability Analysis Methodology

Slope stability analyses of the Fish Creek East WRD were completed using the computer program SLOPE/W Version 8.11, which enables the user to conduct limit equilibrium slope stability calculations by a variety of methods (GEO-SLOPE, 2012). Several methods may be used to search for the critical slip surface, that is, the surface which yields the lowest factor of safety for a given geometry and material properties. The Spencer method (1967) was used to calculate factors of safety for potential critical slip surfaces because that procedure satisfies both force and moment equilibrium, thereby yielding a more rigorous solution than some other commonly used methods.

The slope stability analyses were conducted under static, post-construction and post-earthquake loading conditions. Long term, static loading conditions were represented with effective stress slope stability analyses. To represent post-construction conditions and to capture undrained behavior under rapid loading, the shear strength of the material subject to undrained loading (i.e., the tailing) was represented by a yield undrained shear strength ratio. In so doing, the strength of the tailing at a given location was calculated based on that ratio and the vertical effective confining stress prior to the construction. Consequently, any total stress increase induced by the construction (i.e., added overlying fill) was offset by construction-induced pore pressures. Post-earthquake analyses were completed with the tailing represented by a liquefied undrained shear strength ratio.

3.5.2 Stability Analysis Material Properties

Relevant material properties were adopted for slope stability analyses based on historic and recent testing, which include both in-situ and laboratory procedures, along with relevant information from literature and engineering judgment as described in Section 3.4 above. Key parameters are summarized in Table 3.3.

Evaluation of the downstream face of the pyramidal and cross valley portions of WRD under static loading conditions were completed based on the final configuration of the dump after tailing had been deposited behind the cross valley portion of the dump to elevation 1600 fmsl. These static analyses utilized effective stress shear strength parameters (i.e., effective stress friction angles for most material types with the exception of the bedrock, which was modeled using a Hoek-Brown failure criterion).

Assessment of the stability of the initial lift of the WRD under post-construction loading conditions was completed by utilizing a yield undrained shear strength ratio for the tailing, as discussed in Section 3.4.2. It was assumed that the initial increase in pore water pressure within the underlying tailing due to construction of the first lift of the Fish Creek East WRD was equal to the weight of the overlying waste rock, i.e., 100 percent pore pressure response or a B-bar = 1.0. The depth of penetration of the first lift of waste rock into the underlying tailing was then varied until a factor of safety of 1.0 was achieved. For post-construction slope stability analyses of subsequent lifts, it was assumed that pore pressures would increase by 40 percent of the weight of each subsequent waste rock lift. This assumption is based on maximum pore pressure response recorded in vibrating wire piezometers in underlying tailing during construction of the base working platforms upstream of the TSF embankment.

The undrained shear strength ratio captures the response of the tailing under undrained loading given relatively rapid construction of each subsequent stage of the WRD construction. As the waste rock is anticipated to be relatively free draining, effective shear strength parameters were used to represent the shear strength of the waste rock under post-construction loading conditions.

Based on extensive experience with the Fort Knox tailings and their susceptibility to liquefaction upon the occurrence of the design earthquake, post-earthquake slope stability analyses assumed full liquefaction of the entire tailing mass immediately following the occurrence of the MDE. The strength of the liquefied tailing was represented by a liquefied undrained shear strength ratio as discussed in Section 3.4.2.

3.5.3 Analyzed Slope Configurations

Two representative cross sections of the Fish Creek East WRD were analyzed at different phases of construction. Section A represents the maximum section through the pyramidal portion of the dump where the majority of the waste rock volume will be placed. Section B represents the maximum section through the cross valley portion of the dump, behind which tailing will be deposited up to elevation 1600 fmsl. The locations of the sections selected for analysis are presented in plan view on Figure 1.1 and the sections are presented on Figure 1.2.

For Section A, static and post-earthquake slope stability analyses were performed on the final buildout configuration. This configuration was taken after completion of the pyramidal portion of the waste rock dump to an elevation of 1950 fmsl. The analysis configuration also considers completion of the cross valley portion of the dump with deposited tailing to elevation 1600 fmsl between the pyramidal and cross valley portions of the dump.

Post-construction slope stability analyses performed on Section A include an assessment of factors of safety after construction of each lift of the pyramidal portion of the dump. Analysis of the first lift provided an estimate for the anticipated penetration depth into the underlying tailing. This analysis indicated that the initial 50-foot lift would penetrate approximately 43-feet into the underlying tailing. As noted above, it was assumed that the initial increase in pore water pressure within the underlying tailing due to construction of the first lift was equal to the weight of the overlying waste rock, i.e., a B-bar of 1.0. For post-construction slope stability analyses of subsequent lifts, it was assumed that pore pressures would increase by 40 percent of the weight of each subsequent lift of waste rock.

For Section B, similar to Section A, static and post-earthquake slope stability analyses were performed on the final buildout configuration. This configuration was taken after completion of the cross valley portion of the waste rock dump to an elevation of 1600 fmsl with tailing deposited to elevation 1600 fmsl upstream of the cross valley dump.

Post-construction slope stability analyses performed on Section B include an assessment of anticipated factors of safety of both the upstream and downstream sides of the cross valley dump after construction of each lift. Analyses of the first lift provided an estimate for the anticipated penetration depth into the underlying tailing. These analyses indicated that the initial 25-foot lift (on the downstream side) and 20-foot lift (on the upstream side) would penetrate approximately 23 and 18 feet, respectively into the underlying tailing. As noted above, it was assumed that the initial increase in pore water pressure within the underlying tailing due to construction of the first lift was equal to the weight of the overlying waste rock, i.e., a B-bar of 1.0. For post-construction slope stability analyses of subsequent lifts, it was assumed that pore pressures would increase by 40 percent of the weight of each subsequent lift of waste rock.

3.5.4 Pore Water Pressure Conditions

It is assumed that the waste rock is sufficiently permeable such that no phreatic surface will develop within the WRD above the adjacent tailing elevation. As such, a phreatic surface is generally applied along the existing ground surface (i.e., along the foundation below the WRD and at the tailing surface elevation). When a tailing differential was assumed between the upstream and downstream sides of the cross valley dump, the phreatic surface was assumed to decrease rapidly within the waste rock after entering upstream extent of the cross valley dump. This is a reasonable assumption due to the coarse nature of the mine waste rock. Pore pressures equal to 120 percent of a hydrostatic condition were applied below the phreatic surface based on the analysis of pore water pressure conditions described in Section 3.3. One exception to this is that post-construction analyses of the first lift of tailing were performed assuming a hydrostatic condition because hydrostatic conditions were typically observed near the surface of the tailing just below the base of the first construction lift. This increases the conservatism for analyses considering subsequent lifts because it allows for less mine waste rock penetration into the underlying tailing. Allowing more mine waste rock to penetrate into the underlying tailing than that which would occur in the field would artificially increase factors of safety for subsequent lifts.

3.5.5 Stability Analysis Results

Results of the slope stability analyses are summarized on Table 3.5 with the slope configurations and location of the critical slip surfaces illustrated in Appendix D. Factors of safety for static loading conditions should exceed the commonly accepted minimum value of 1.3 for non-impounding facilities to provide adequate safe and secure storage of mine waste rock within the WRD configuration. Inspection of the results summarized in Table 3.5 indicates that the downstream face of the WRD meets that criterion for each case considered

Since both post-construction and post-earthquake loading conditions address transient conditions whereby elevated pore pressures (either induced by rapid undrained loading or earthquake shaking) temporarily reduce the stability of the slope, a lower factor of safety is typically accepted for such transient conditions with the understanding that the stability associated with long term effective stress conditions will be regained over time as the induced pore pressures dissipate. With that in mind, it can be observed on Table 3.5 that the downstream faces of both the cross valley and pyramidical portions of the WRD are generally expected to maintain adequate, although somewhat reduced, factors of safety upon completion of the construction of each lift.

To expand on the analyses of post-construction loading conditions described above, the post-construction analysis of the initial lift of mine waste rock over tailing assumed instant application of the load with 100 percent pore pressure generation. The thickness of displaced tailing was varied to yield a computed factor of safety of 1.0. This comprises the volume of tailing that will likely be displaced as that initial lift is pioneered across the tailing surface. Movement of mine waste rock into the tailing surface is expected and requires appropriate construction sequencing as a result; however, subsequent placement of mine waste rock will be completed in lifts so the rate of rise can be controlled in response to any observed spikes in pore pressures within the tailing, i.e., load application is not actually instant as assumed in the analyses. Also, placement of subsequent lifts was not assumed to yield 100 percent pore pressure generation. Since observation of pore pressure response to construction over tailing along the upstream face of the TSF embankment in 2009 showed a maximum response of about 40 percent, analyses of subsequent lifts allowed for a similar response. It is of note that adequate post-construction factors of safety are dependent on the assumption that construction-induced pore water pressures will generally dissipate between completion of each lift and the start of construction of a subsequent lift. This is a reasonable assumption based on observed performance of the tailing elsewhere in the Fort Knox TSF; however, because of potential drainage issues in the vicinity of Fish Creek East due to the possibility of relatively continuous ice lenses in the tailing mass, it is highly recommended that instrumentation, i.e., vibrating wire piezometers, be installed and that pore pressures in the tailing underlying the proposed WRD be monitored and interpreted by a qualified geotechnical engineer during construction.

Slope stability analyses of the Fish Creek East WRD under post-earthquake loading conditions indicate that the occurrence of the MDE, with the associated liquefaction of the tailing impounded within the Fort Knox TSF, would result in post-earthquake factors of safety of less than 1.0. It must be understood that such results do not necessarily indicate unacceptable performance of the facility but rather that some permanent earthquake-induced deformations of the slope are anticipated. Acceptable performance is then based on the estimated magnitude and anticipated consequence of such movements. As such, additional analyses were required to estimate the deformations anticipated due to the occurrence of the MDE and to illustrate that these movements are not expected to be of an extent that would result in massive displacement of downstream tailing or impact on the containment provided by the downstream TSF embankment.

3.6 Earthquake-Induced Deformation Analyses

3.6.1 Overview

The earthquake-induced deformation analyses discussed in this section aim to evaluate the liquefaction potential of the tailings and the associated deformations of the Fish Creek East WRD upon the occurrence of the design earthquake. Sections A and B presented in Section 3.5.3 were used in the earthquake-induced deformation analyses. The numerical models for Sections A and B were built using a multi-stage approach that allows stresses and deformations to come to equilibrium under static loading after a raise has been constructed prior to the application of the next raise. Single-stage models are much easier to implement, but multi-stage models are more representative of field conditions and actual in-situ stresses induced by construction stages. The multi-stage model represents six stages of construction for Section A and two stages of construction for Section B as indicated on Figures 3.20 and 3.29.

3.6.2 Deformation Analysis Methodology

Deformation analyses of the Fish Creek East WRD were performed using the computer program FLAC 8.0. FLAC utilizes an explicit finite-difference formulation, which can model complex geomechanical behaviors such as non-linear material behavior and yield/failure/collapse of loose, hydraulically-placed soils due to undrained unloading or earthquake ground motions. FLAC simulates the behavior of structures built of soil, rock or other materials that may undergo plastic deformation when their yield limits are reached. Materials are represented by zones that form a grid that is adjusted by the user to fit the shape of the structure to be modeled. The results of the FLAC modeling include identification of potentially-liquefiable zones within a soil stratum and an estimation of deformations due to various loading conditions. Contrary to most other commercially-available software, FLAC has the capability to track pore water pressures and effective stresses during deformation using a time-marching analysis scheme, which allows for the use of effective-stress based constitutive models, such as UBCSand, for modelling the behavior of structures during seismic events. Unlike other numerical analysis codes that search for a converged endpoint solution at equilibrium, FLAC marches (or steps) towards equilibrium, while allowing the stresses in each element to follow their natural stress paths.

3.6.3 Model Development

3.6.3.1 Model Geometry

Sections A and B of the Fish Creek East WRD discussed in Section 3.5.3 were used for the earthquake-induced deformation analyses. The locations of Sections A and B selected for analysis are presented in plan on Figure 1.1. Section A was built to analyze the pyramidal portion of the WRD. Section B was built to analyze the cross valley portion of the WRD.

3.6.3.2 Finite Difference Mesh

Figures 3.20 and 3.29 illustrate the FLAC mesh developed for Section A and Section B, respectively. These figures also show material zones. The mesh was designed fine enough to allow for dynamic wave propagation while coarse enough to optomize computational speed. The mesh size was calculated based on the maximum earthquake frequency and assumed average material shear wave velocity. The mesh includes both rectangular and triangular elements. The typical rectangular element height is approximately 5 feet and the horizontal length varies from 5 to 50 feet. Narrower elements were used around the critical section of the Fish Creek WRD where higher accuracy is needed, but wider elements were used closer to the boundaries. In general, it is good practice to limit the use of triangular elements to the surface of a model, because excessive use of triangular elements may result in numerical instability in the FLAC computations. Triangular elements were required in the interior of the WRD because the construction stage forms a temporary exterior slope, which requires the use of triangular nodes. These elements remain within the WRD when the next construction raise is added. A linear elastic constitutive model is assigned to the triangular elements located along the external face to prevent numerical instability.

The construction stages modeled for Section A are summarized as follows:

- Stage 1: Current configuration (prior to WRD construction)
- Stage 2: Crest Elevation 1600 feet - assumed construction date end of 2018 (for simplicity the tailings located behind the cross valley dump were added at this stage)
- Stage 3: Crest Elevation 1650 feet - assumed construction date end of 2020
- Stage 4: Crest Elevation 1750 feet - assumed construction date second quarter of 2021
- Stage 5: Crest Elevation 1850 feet - assumed construction date end of 2021
- Stage 6: Crest Elevation 1950 feet - assumed construction date end of 2022

The construction stages modeled for Section B are summarized as follows:

- Stage 1: Current configuration (prior to WRD construction)
- Stage 2: Crest Elevation 1600 feet - assumed construction date end of 2018

3.6.3.3 Modeling Procedure

The FLAC deformation analyses for Section A and Section B included the following modeling steps:

- Step 1: Build model geometry (mesh)
- Step 2: Set boundary conditions (roller boundaries during static phase)
- Step 3: Set (turn on) gravity
- Step 4: Apply material properties using the selected constitutive material models
- Step 5: Apply pore pressure conditions, calculate stress-state for static equilibrium
  - Repeat Steps 4 and 5 for each stage to allow for construction of the successive raises and stress-state definition
- Step 6: Adjust the bulk and shear moduli to account for moduli depth variation, recalculate stress-state for static equilibrium
- Step 7: Modify UBCSand parameters in anticipation of the dynamic simulation (some UBCSand parameters differ between static and dynamic loading)
- Step 8: Reset displacements and velocities to zero
- Step 9: Create compliant boundary conditions at the base of the model and free-field boundary conditions at the edges of the model
- Step 10: Apply acceleration (stress) history to the base of the model
- Step 11: Run the dynamic simulations

3.6.3.4 Boundary Conditions

Boundary conditions differed for static and dynamic analyses. For static analysis, the bottom and side model boundaries were modelled as “roller” geomechanical boundaries. For dynamic analysis, a compliant base was assigned to the bottom boundary of both sections analyzed. A complaint base allows for application of the seismic loading and for downward propagating waves to be absorbed by the boundary instead of being unrealistically reflected back into the model, as would occur with rigid boundaries. The side (or vertical) boundaries were simulated as free-field boundaries, which allow for shear waves to propagate through the vertical boundaries in the horizontal direction. The free-field boundaries do not impose displacement restrictions, as with fixed or roller boundaries. As such, these boundary conditions could result in some large unrealistic deformations in the upstream direction at the right (Section A) and right and left (Section B) boundaries, where the potentially liquefiable tailings were artificially cut-off vertically. The tailings are actually constrained against downstream or upstream (section B only) movement by additional tailings (located beyond the model boundaries) and then further away by the natural ground or by the dam. To preclude unrealistic failure and large deformations due to boundary artifact, a wide zone of material was modelled along the side boundaries where necessary using linear elastic material properties (no plastic flow failure or liquefaction allowed). Such boundaries allow for wave propagation and constrain the liquefiable tailings, and only minor boundary displacements are observed. In addition, the right boundary was extended a significant distance from the waste rock dump to minimize the effects of the boundary on the areas of interest.

3.6.3.5 Pore Pressure Distribution

The initial (prior to occurrence of the MDE) pore pressure conditions for Sections A and B were defined based on observations discussed in Section 3.3. A pore pressure profile corresponding to 120 percent of hydrostatic was applied to both sections. Figures 3.21 and 3.30 shows the initial pore pressure conditions for the fully built sections.

3.6.4 Deformation Analysis Material Properties

Relevant material properties were adopted for earthquake-induced deformation analyses based on historic and recent testing, which include both in-situ and laboratory procedures, along with relevant information from literature and engineering judgment as described in Section 3.4. Key parameters are summarized in Table 3.4.

3.6.5 Acceleration Time Histories

As discussed in Section 2.2, the three spectrally matched acceleration time histories have been utilized in the earthquake-induced deformation analyses. These acceleration time histories were processed and applied to the compliant boundary of the numerical model in the form of stress. Accelerations cannot be applied directly to a compliant boundary because the boundary must move freely in order to absorb downward propagating waves. The acceleration time history processing included a deconvolution using the methodology described in Mejia and Dawson (2006) and conversion to stress time history.

3.6.6 Deformation Analysis Results

3.6.6.1 Deformations

The initial (prior to occurrence of the MDE) total and effective stresses are provided in Figure 3.22 and 3.23 for Section A. Figures 3.24 and 3.25 present the seismic horizontal and vertical displacement contours for Section A. Figure 3.26 presents the horizontal and vertical displacement histories at selected locations for Section A. Selected history locations are shown on Figure 3.20 for Section A. This same information is presented on Figures 3.31 through 3.35 for Section B. Selected locations are shown on Figure 3.29 for Section B.

Results for Section A shows a maximum settlement of approximately 10 feet within the tailings. The maximum settlement observed within the pyramidal portion of the dump waste rock is approximately 4 feet. The maximum horizontal displacement observed within the within the pyramidal portion of the dump waste rock is approximately 4 feet. Results for Section B shows a maximum of approximately 10 feet of settlement within the waste rock. This expected settlement is confined to the downstream edge of the WRD and is not anticipated to result in loss of tailing containment. The maximum horizontal displacement observed within the cross valley portion of the dump is approximately 17 feet. The horizontal and vertical displacement histories for Sections A and B show that displacements stop shortly after the end of shaking.

3.6.6.2 Liquefaction Extents

Cyclic liquefaction occurs during earthquake loading when the ratio of excess pore water pressure to initial vertical effective stress reaches 1.0. Figures 3.27 and 3.28 present pore water pressure and the maximum ratio of excess pore water pressure to initial vertical effective stress recorded during the earthquake-induced deformation analyses for Section A. This same information is presented for Section B on Figures 3.36 and 3.37.

Review of the results indicate that positive excess pore pressures develop within most of the tailings during earthquake loading. In general, full liquefaction is indicated in tailings areas that are not confined by the overlying waste rock. The confinement of the tailings induced by the overlying waste rock is acting against liquefaction and reducing liquefaction potential of the underlying tailings. Consequently, while the liquefaction extent of the tailings is significant, the tailings located below the waste rock dump has a lower liquefaction potential, which improves waste rock dump stability and reduces displacements.

Section 4.0 - Conclusions and Recommendations

Recent work on the proposed pyramidal and cross valley portions of the Fish Creek East WRD over existing tailing has included: (1) geotechnical site investigations and laboratory testing, (2) limit equilibrium slope stability analyses under static, post-construction and post-earthquake loading conditions, and (3) two-dimensional site response, two-dimensional liquefaction assessment and permanent earthquake-induced deformation analyses. With the completion of that work, a number of significant conclusions can be drawn and recommendations made with regard to the anticipated construction and long-term performance of the proposed WRD:

- Analysis of the site investigation data including CPT, shear wave velocity and pore pressure dissipation test data has indicated conditions in the vicinity of the proposed Fish Creek East WRD that have not been observed elsewhere in the Fort Knox TSF. Specifically, the deposit in this area appears to contain layers of frozen tailing, as indicated by abnormally high tip resistance, low sleeve friction and high shear wave velocities compared with what has been observed elsewhere in the deposit. In addition, pore pressures in excess of hydrostatic have been observed in between the suspected frozen layers, suggesting that the rate of consolidation is not keeping up with the rate of tailing deposition in some locations. This is likely because pore water drainage is somewhat impeded by the layers of frozen tailing.
- Analysis of the laboratory testing data indicates that the tailing in the vicinity of the Fish Creek East WRD is generally consistent with the coarser tailing existent in the vicinity of the Yellow Pup WRD. As such, advanced geotechnical testing previously performed on that material has been utilized to characterize the tailing in the vicinity of the Fish Creek East WRD.
- Slope stability analyses performed on full build out configurations of the pyramidal and cross valley portions of the WRD under static loading conditions give factors of safety that meet or exceed industry-accepted standards for non-impounding facilities, which indicate that the expanded WRD should exhibit adequate slope stability under such conditions assuming that conditions modeled are representative of those encountered in the field. Should conditions be noted during construction and/or operation of the facility that vary significantly from those modeled, the stability of the expanded WRD should be re-evaluated at that time.
- Post-construction slope stability analysis of the initial lift of mine waste rock to be pioneered across the surface of the existing tailing indicates that the initial 50-foot-thick lift of the pyramidal portion of the WRD is expected to displace about 43 feet of tailing. The initial 20 to 25-foot-thick lift of mine waste rock placed in the cross valley area is expected to displace about 18 to 23 feet of tailing. Mine waste rock will be delivered by haul truck, plug dumped as close to the advancing face as deemed prudent and, subsequently, spread by push dozer. The push dozers should maintain a windrow of mine waste rock in front of their blades to remain a reasonable distance back from the advancing face in the event of a small bench-scale slip of mine waste rock into the tailing as the face is advanced.
- Post-earthquake slope stability analyses of the Fish Creek East WRD indicate factors of safety less than 1.0 due to liquefaction of the underlying tailing. While this does not necessarily indicate inadequate performance, it does mean that some permanent earthquake-induced deformations would be expected on the occurrence of the MDE. This necessitated subsequent deformation analyses of the facility.
- Results of permanent earthquake-induced deformation analyses following occurrence of the MDE indicate that anticipated deformations may be significant, i.e., up to approximately 4 feet horizontally and 4 feet vertically for the pyramidal portion of the dump and up to approximately 17 feet horizontally and 10 feet vertically for the cross valley portion of the dump.
- While deformations on the order of these may have been deemed problematic in the presence of a geomembrane liner or thin engineered fill zones (e.g., the core of a dam), they are not expected to have an adverse impact on the WRD beyond some potential regrading of haul roads, WRD benches, et cetera.
- Given: (1) the estimated magnitude of the deformations, (2) the associated volume of tailing and water that may be displaced after the occurrence of the MDE due to those deformations, and (3) the distance from the WRD to the TSF embankment, permanent earthquake-induced deformations of such a

magnitude in response to the occurrence of the MDE are not likely to impact the operation, capacity or freeboard of the TSF.

- The results of the geotechnical engineering analyses indicate that the performance of the proposed configurations of the pyramidal and cross valley portions of the WRD should be acceptable provided that the conditions modeled are representative of those in the field; however, due to the variation in site conditions observed in the vicinity of the proposed WRD compared with what has been observed elsewhere, there is additional uncertainty regarding the anticipated behavior of the tailing deposit in this location with respect to the propensity for pore pressure dissipation during construction or following an earthquake event. Because of this, FGMI should pay close attention to the performance of the slope faces during construction. To maintain a safe working environment, frequent inspections of the advancing face and emplaced mine waste rock should be made. Consideration should be given to any signs of distress (e.g., tension cracking parallel to the advancing face, bulging of the slope above the toe, water or tailing ejected on the surface of the mine waste rock fill, etc.) before work proceeds in that vicinity. Once the initial lift of mine waste rock is in place, it is strongly recommended that vibrating wire piezometers be installed via drill holes through the mine waste rock into the underlying tailing to monitor excess pore pressures induced by ongoing construction, which could be indicative of a pending undrained failure. It is possible that pore pressures will take longer to dissipate in this area due to the layers of frozen tailing indicated by the site investigation program. Installation of the piezometers should allow for optimized sequencing of mine waste rock placement to reduce the risk of undrained slope failure during construction. It would also be advisable to install survey monuments to monitor settlement and horizontal movement near and along the slope of the WRD.

Section 5.0 - References

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Section 6.0 - Acronyms and Abbreviations

$(N_1)_{60}$	Normalized Standard Penetration Test Blow Count
Alaska DGGS	Alaska Division of Geological and Geophysical Surveys
ASTM	Americal Society of Testing and Materials
B	Bulk Modulus
BCHLF	Barnes Creek Heap Leach Facility
CPT	Cone Penetration Test
CU	Consolidated Undrained
$CRR_{7.5}$	Cyclic Resitance Ratio for a Magnitude 7.5 Earthquake
F	Modification Factor
FGMI	Fairbanks Gold Mining, Inc.
fmsl	Feet (above) Mean Sea Level
G	Shear Modulus
G_{max}	Small Strain Shear Modulus
G_s	Specific Gravity
ICU	Isotropically Consolidated Undrained
$K_{2,max}$	Shear Modulus Number
K_b	Bulk Modulus Number (UBCSAND)
K_{gp}	Plastic Shear Stiffness Number (UBCSAND)
Knight Piésold	Knight Piésold and Co.
K_o	At-Rest Lateral Earth Pressure Coefficient
MCE	Maximum Credible Earthquake
MDE	Maximum Design Earthquake
MPa	Megapascal
OBE	Operating Basis Earthquake
p_{atm}	Atmospheric Pressure
Pcf	Pounds Per Cubic Foot
PHGA	Peak Horizontal Ground Acceleration
PPD	Pore Pressure Dissipation
q_c	Measured CPT Tip Resistance
q_{c1}	Tip Resistance Normalized to one Atmosphere
SBTn	Normalized Soil Behavior Type
SPT	Standard Penetration Test
S_u(liq)	Liquefied Undrained Shear Strength
S_u(yield)	Yield Undrained Shear Strength
S-Wave	Shear Wave
USCS	Unified Soil Classification System
V_s	Shear Vave Velocity

WCHLF	Walter Creek Heap Leach Facility
WRD	Waste Rock Dump
w_{sat}	Saturated Moisture Content
Zf	Quartz Muscovite Schist
Zfa	Quartzose Schist
ϕ'_{cv}	Constant Volume Friction Angle
ϕ'_{p}	Peak Friction Angle
ϕ'	Effective Friction Angle
γ_{dry}	Dry Unit Weight
γ_{sat}	Saturated Unit Weight
γ_{w}	Unit Weight of Water
ν	Poisson's Ratio
ρ_{sat}	Saturated Density
σ'	Effective Stress
σ'_{m}	Mean Effective Stress
σ'_{v}	Vertical Effective Stress
σ'_{vo}	Initial Vertical Effective Stress

Tables

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Table 3.1
Fairbanks Gold Mining, Inc.
Fort Knox Project
Fish Creek East Waste Rock Dump
Report on Geotechnical Evaluation of Dump Construction Over Existing Tailing

Summary of Tailing Geotechnical Index Testing

CPT Probe No.	Sample Depth (ft)	Particle Size Distribution Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Fines Content (%)	Plasticity Index PI (%)	Unified Soil Classification System	
CPT-23	30.0	0.0	38.4	53.7	7.9	61.6	NP	ML	sandy SILT
CPT-23	150.0	0.0	44.3	45.2	10.5	55.7	NP	ML	sandy SILT
CPT-24	30.0	0.0	30.8	61.0	8.2	69.2	NP	ML	sandy SILT
CPT-24	160.0	0.0	41.8	47.9	10.3	58.2	NP	ML	sandy SILT
CPT-25	20.0	0.0	65.4	29.4	5.2	34.6	NP	SM	silty SAND
CPT-25	80.0	0.0	74.1	19.9	6.0	25.9	NP	SM	silty SAND
CPT-26	80.0	0.0	24.9	63.6	11.5	75.1	NP	ML	SILT with sand
CPT-26	100.0	0.0	47.3	43.6	9.1	52.7	NP	ML	sandy SILT
CPT-27	74.0	0.0	56.2	37.4	6.4	43.8	NP	SM	silty SAND
CPT-28	50.0	0.0	57.4	34.3	8.3	42.6	NP	SM	silty SAND
CPT-28	73.0	0.0	70.4	22.5	7.1	29.6	NP	SM	silty SAND
CPT-29	25.0	0.0	66.7	28.8	4.5	33.3	NP	SM	silty SAND
CPT-29	50.0	0.0	52.6	39.9	7.5	47.4	NP	SM	silty SAND
CPT-29	155.0	0.0	44.8	44.5	10.7	55.2	NP	ML	sandy SILT
CPT-30	20.0	0.0	48.6	46.0	5.4	51.4	NP	ML	sandy SILT
CPT-30	120.0	0.0	41.7	46.7	11.6	58.3	NP	ML	sandy SILT
CPT-30	140.0	0.0	66.6	25.5	7.9	33.4	NP	SM	silty SAND
CPT-30	180.0	0.0	33.5	52.1	14.4	66.5	NP	ML	sandy SILT
CPT-32	35.0	0.0	76.6	17.4	6.0	23.4	NP	SM	silty SAND
CPT-32	70.0	0.0	65.7	29.7	4.6	34.3	NP	SM	silty SAND
CPT-32	120.0	0.0	41.5	51.9	6.6	58.5	NP	ML	sandy SILT
CPT-32	220.0	0.0	28.7	57.0	14.3	71.3	3	ML	SILT with sand

Table 3.2
Fairbanks Gold Mining, Inc.
Fort Knox Project
Fish Creek East Waste Rock Dump
Report on Geotechnical Evaluation of Dump Construction over Existing Tailing

Summary of Tailing Natural Moisture Content and Specific Gravity Testing with Computed In-Situ Densities

Bucket No.	CPT Probe No.	Sample Depth Interval		Average Depth	Natural Moisture Content	Specific Gravity	Dry Unit Weight(1)	Saturated Unit Weight(2)
		From	To		w	G_s	γ_w	γ_{sat}
		(ft)	(ft)	(ft)	(%)		(pcf)	(pcf)
1	CPT-23	30	85.0	57.5	51.8%	2.713	70.4	106.8
2	CPT-23	100	150.0	125.0	39.1%	2.693	81.9	113.9
3	CPT-23	175	250.0	212.5	34.9%	2.706	86.8	117.1
4	CPT-24	30	100.0	65.0	58.4%	2.709	65.5	103.7
5	CPT-24	120	176.0	148.0	31.2%	2.743	92.2	121.0
6	CPT-25	0	120.0	60.0	37.1%	2.715	84.4	115.7
7	CPT-25	120	160.0	140.0	80.3%	2.730	53.4	96.2
8	CPT-26	0	80.0	40.0	38.2%	2.718	83.2	115.0
9	CPT-26	100	140.0	120.0	39.0%	2.731	82.5	114.7
10	CPT-26	160	180.0	170.0	26.7%	2.701	97.9	124.1
11	CPT-27	0	103.0	51.5	39.2%	2.692	81.7	113.8
12	CPT-27	125	145.0	135.0	27.5%	2.736	97.4	124.2
13	CPT-28	30	100.0	65.0	39.5%	2.704	81.6	113.8
14	CPT-28	120	180.0	150.0	41.7%	2.756	80.0	113.4
15	CPT-28	200	240.0	220.0	28.3%	2.701	95.5	122.6
16	CPT-29	25	100.0	62.5	38.6%	2.741	83.1	115.2
17	CPT-29	100	156.0	128.0	27.9%	2.705	96.2	123.0
18	CPT-30	0	80.0	40.0	36.3%	2.719	85.4	116.4
19	CPT-30	90	180.0	135.0	41.3%	2.725	80.0	113.0
20	CPT-32	35	175.0	105.0	29.4%	2.747	94.8	122.7
21	CPT-32	200	246.0	223.0	49.9%	2.734	72.2	108.2
22	CPT-32	70	90.0	80.0	22.9%	2.710	104.3	128.2

Notes:

1. $\gamma_{dry}=G_s*\gamma_w/(w*G_s+1)$
2. $\gamma_{sat}=\gamma_w+\gamma_{dry}*(1-1/G_s)$

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Table 3.3a
Fairbanks Gold Mining, Inc.
Fort Knox Project
Fish Creek East Waste Rock Dump
Report on Geotechnical Evaluation of Dump Construction over Existing Tailing

Summary of Material Properties for Limit Equilibrium Slope Stability Analyses

Material Type	Unified Soil Classification	Unit Weight		Effective Friction Angle	Undrained Shear Strength Ratio	
		Moist	Saturated		Yield	Liquefied
		γ_m (pcf)	γ_{sat} (pcf)	ϕ' (deg)	$S_{u,yield}/\sigma_{vo}'$	$S_{u,liq}/\sigma_{vo}'$
Mine Waste Rock	GP poorly graded GRAVEL	123.6	136.7	36.0	N/A	N/A
Tailing	ML and SM sandy SILT, silty SAND, etc.	N/A	115.0	34.3	0.230	0.055
Bedrock Foundation	Fairbanks Schist	165.6	166.0	N/A (1)	N/A	N/A

Notes:
1. Shear strength of the bedrock foundation governed by a Hoek-Brown non-linear shear strength envelope per the parameters listed in Table 3.3b

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Table 3.3b
Fairbanks Gold Mining, Inc.
Fort Knox Project
Fish Creek East Waste Rock Dump
Report on Geotechnical Evaluation of Dump Construction over Existing Tailing

Bedrock Foundation Hoek-Brown Shear Strength Parameters

Material Type	Parameter	Value
Bedrock Foundation	GSI	31.9
	Hoek-Brown m_i Parameter	12
	Hoek-Brown D Parameter	0
	Hoek-Brown a Parameter	0.52
	Hoek-Brown m_b Parameter	1.055
	Hoek-Brown s Parameter	0.0005
	UCS (psf)	174,557
	Unit Weight (pcf)	See Table 3.3a

Notes:
1. GSI refers to geological strength index.
2. UCS refers to uniaxial compressive strength.

Table 3.4
Fort Knox Project
Fish Creek East Waste Rock Dump

Summary of Material Properties for Earthquake-Induced Deformation Analyses

Material Type	Unified Soil Classification	Material Model	Dry Unit Weight [1]	Porosity[2]	Effective Stress Friction Angle [3]	Poisson's Ratio [4]	Shear Modulus Number[5]	Small Strain Shear Modulus [6]	Bulk Modulus[7]	UBCSAND						
			γ_{dry} (slug/ft^3)	n	ϕ' (deg)	ν	$K_{2,max}$	G_{max} @1atm (lbf/ft^2)	B @1atm (lbf/ft^2)	$(N_1)_{60}$[8]	K_g[9]	K_b[10]	K_{gp}[11]	ϕ'_{cv}[12] (deg)	ϕ'_p[13] (deg)	R_f[14]
Tailings	sandy SILT, silty SAND, etc. ML and SM	UBCSAND (Liquefiable)	2.6	0.50	N/A	0.200	26	1.2E+06	1.6E+06	8.1	572	763	213	33.5	34.3	0.9
Mine Waste Rock	poorly graded GRAVEL GP	Mohr-Coulumb (Non-Liquefiable)	3.7	0.29	36	0.292	84	3.9E+06	8.1E+06	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bedrock Foundation	Fairbanks Schist	Elastic (Non-Liquefiable)	5.1	0.01	N/A	0.200	N/A	1.7E+07	2.3E+07	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:
1. In-situ dry unit weight of the tailing and bedrock foundation is based on laboratory testing information.
2. Porosity of the tailing was calculated from median dry unit weight and average specific gravity of data on Table 3.1. Porosity of the waste rock based on dry unit weight achieved in the field during waste rock dump construction. Porosity of the bedrock foundation based on density measurements on HQ3 core samples.
3. Effective stress friction angle of the waste rock based on the angle of repose observed within various waste rock dump slopes at the Fort Knox mine site.
4. $K_o = 1-\sin\phi'$ after Lambe and Whitman (1969) and $\nu = K_o/(1+K_o)$ for drained loading. A small strain value of 0.2 was used for cyclic loading of tailing (UBCSAND). Poisson's ratio for bedrock foundation adopted from Krynine and Judd (1957).
5. Shear modulus number of tailing estimated from shear wave velocity measurements performed during cone penetration testing. Modulus number for the waste rock based on recommendations by Seed et al. (1986).
6. For tailing and mine waste rock $G_{max} = 22{*}K_{2,max}{*}(\sigma'_m{*}P_{atm})^{0.5}$ where $\sigma'_m = (\sigma'_v+2{*}K_o{*}\sigma'_v)/3$ after Seed and Idriss (1970), Young's modulus for foundation bedrock adopted from Krynine and Judd (1957); foundation bedrock shear modulus calculated from Young's modulus and Poisson's ratio.
7. $B = G{*}2(1+\nu)/(3(1-2\nu))$
8. $(N_1)_{60}$ calculated from representative $CRR_{7.5}$ value of 0.09 conservatively estimated from CPT data using equations developed during NCEER workshops (Youd et al., 2001).
9. K_g - shear modulus number; $K_g = G_{max}/P_{atm}$ at a mean effective stress of one atmosphere $\sigma'_m = P_{atm.}$
10. K_b - bulk modulus number; $K_b = K_g{*}2(1+\nu)/(3(1-2\nu))$ with ν=0.2 for small strain tailings behavior.
11. K_{gp} - plastic shear stiffness and flow rule; $K_{gp} = K_g{*}(N1)_{60}{}^2{*}0.003+100$ after Beaty (2011).
12. ϕ'_{cv} - constant volume friction angle estimated as the phase transformation friction angle from triaxial testing per Negussey, et al. (1987).
13. ϕ'_p - maximum friction angle that can be mobilized; estimated as $\phi'_{cv}+(N_1)_{60}/10$.
14. R_f - hyperbolic fitting coefficient; estimated based on UBCSAND user manual.

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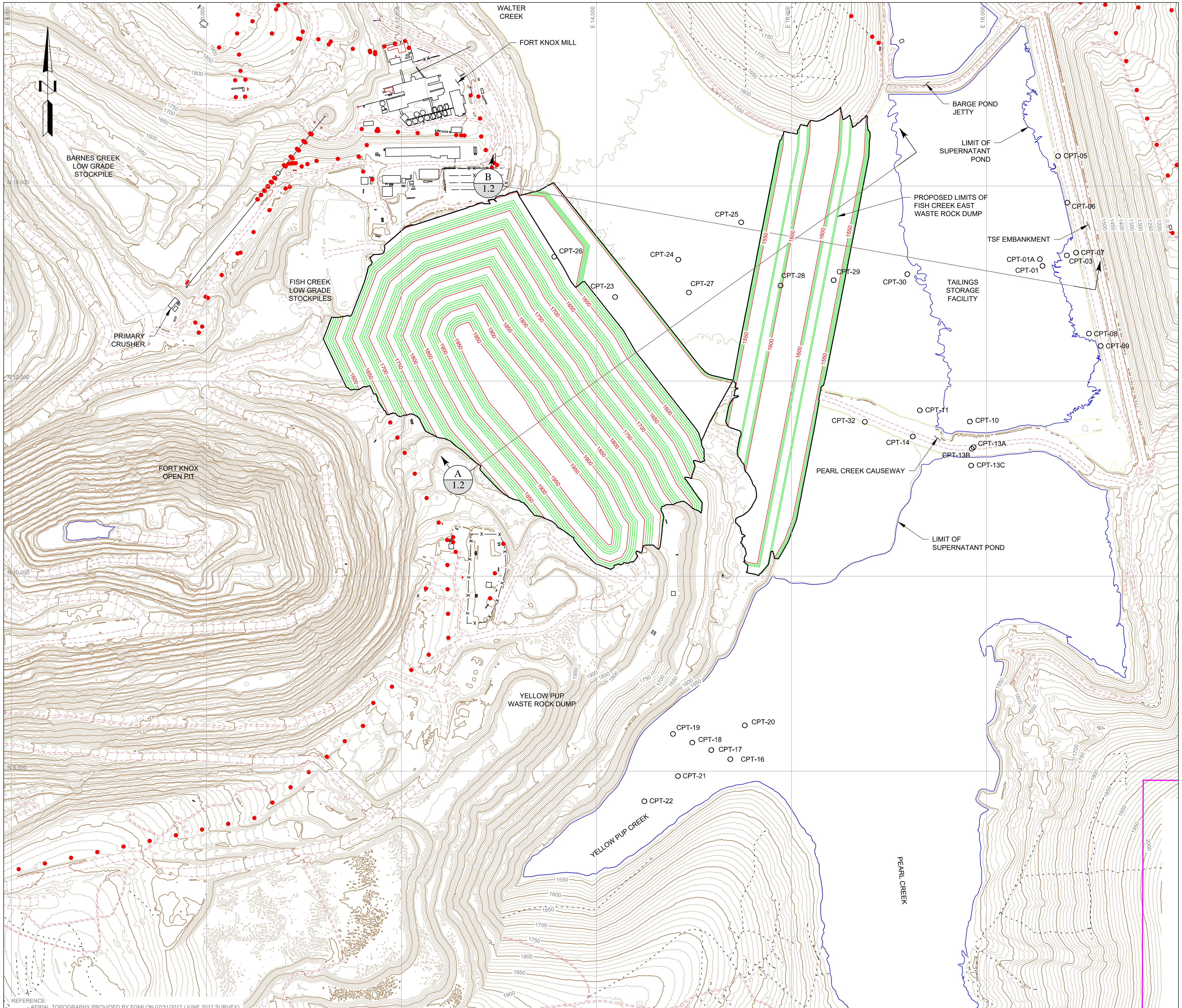
Table 3.5
Fairbanks Gold Mining, Inc.
Fort Knox Project
Fish Creek East Waste Rock Dump
Report on Geotechnical Evaluation of Dump Construction Over Existing Tailing

Summary of Limit Equilibrium Slope Stability Analysis Results

Analysis Type	Section	Description	Computed Factor of Safety
Static	A	Full Build Out Downstream	2.4
	B	Full Build Out Downstream	3.0
Post-Earthquake	A	Full Build Out Downstream	0.7
	B	Full Build Out Downstream	0.3
Post-Construction	A	Lift #1 Downstream	1.0
		Lift #2 Downstream	1.1
		Lift #3 Downstream	1.2
		Lift #4 Downstream	1.2
		Lift #5 Downstream	1.2
		Lift #6 Downstream	1.2
		Lift #7 Downstream	1.2
		Lift #8 Downstream	1.2
	B	Lift #1 Downstream	1.0
		Lift #1 Upstream	1.0
		Lift #2 Downstream	1.2
		Lift #2 Upstream	1.2
		Lift #3 Downstream	1.2
		Lift #3 Upstream	1.2

Notes:
1. SLOPE/W output plots included in Appendix D.

Figures



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LEGEND:

- 1500 GROUND CONTOUR AND EL, FEET (MSL)
- ROAD
- FGMI PROPERTY BOUNDARY
- STRUCTURE
- FENCE
- TRAIL
- STREAM
- CPT-01 COMPLETED CPT PROBE LOCATION AND DESIGNATION

CPT PROBE DETAILS				
CPT No.	NORTHING (ft)	EASTING (ft)	EXISTING GROUND ELEVATION (fmsl)	APPROXIMATE PROBE DEPTH (ft)
CPT-23	12,862.07	14,190.44	1,543.6	240
CPT-24	13,245.30	14,838.73	1,540.4	255
CPT-25	13,628.23	15,484.19	1,537.1	175
CPT-26	13,275.14	13,566.51	1,544.2	250
CPT-27	12,909.32	14,947.20	1,539.8	255
CPT-28	12,980.24	15,886.81	1,536.7	260
CPT-29	13,034.64	16,431.56	1,534.4	305
CPT-30	13,096.80	17,187.36	1,530.1	315
CPT-31	CPT ELIMINATED FROM PROGRAM			
CPT-32	11,582.08	16,751.84	1,543.1	225

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

500 0 500 1000 FEET
1"=500' AT FULL SIZE (ANSI D)
1"=1000' AT HALF SIZE (ANSI B)

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	PROPOSED WASTE ROCK DUMP LAYOUT
CLIENT	FAIRBANKS GOLD MINING, INC.

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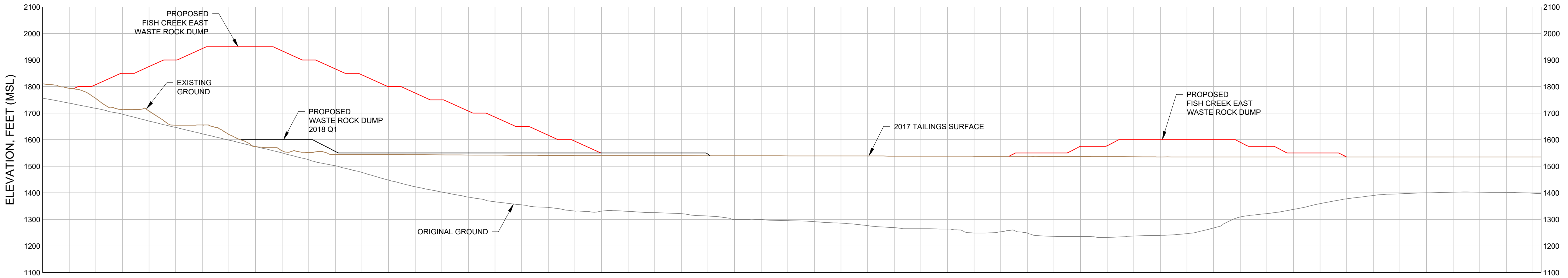
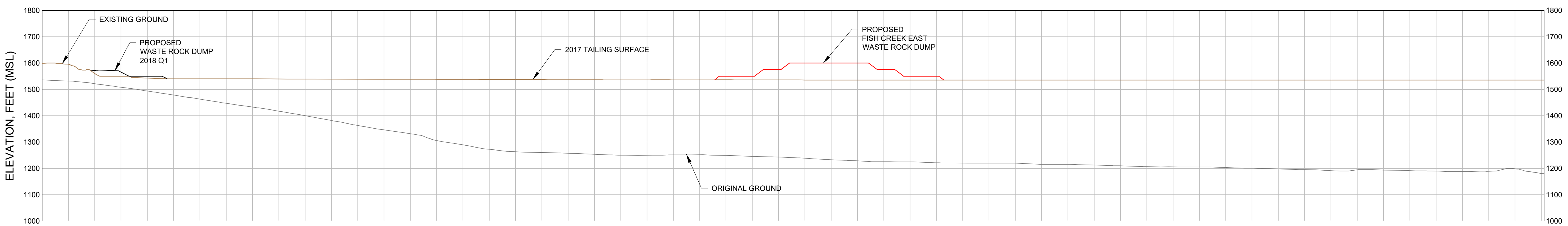
DESIGNED BY	PD	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	CB	DV101	00336.08	1.1	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		



DISTANCE, FEET

A
1.1
FISH CREEK EAST WASTE ROCK DUMP CROSS SECTION
NORMAL TO NORTHEASTERN DUMP FACE

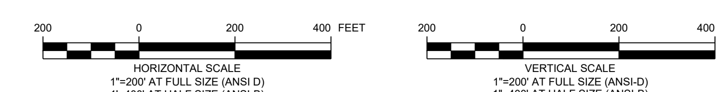


DISTANCE, FEET

B
1.1
CROSS VALLEY WASTE ROCK DUMP CROSS SECTION
NORMAL TO EASTERN DUMP FACE

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).



PROJECT	FORT KNOX PROJECT ADDITIONAL WASTE ROCK DUMP CAPACITY
TITLE	PROPOSED WASTE ROCK DUMP CROSS SECTIONS
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	PD	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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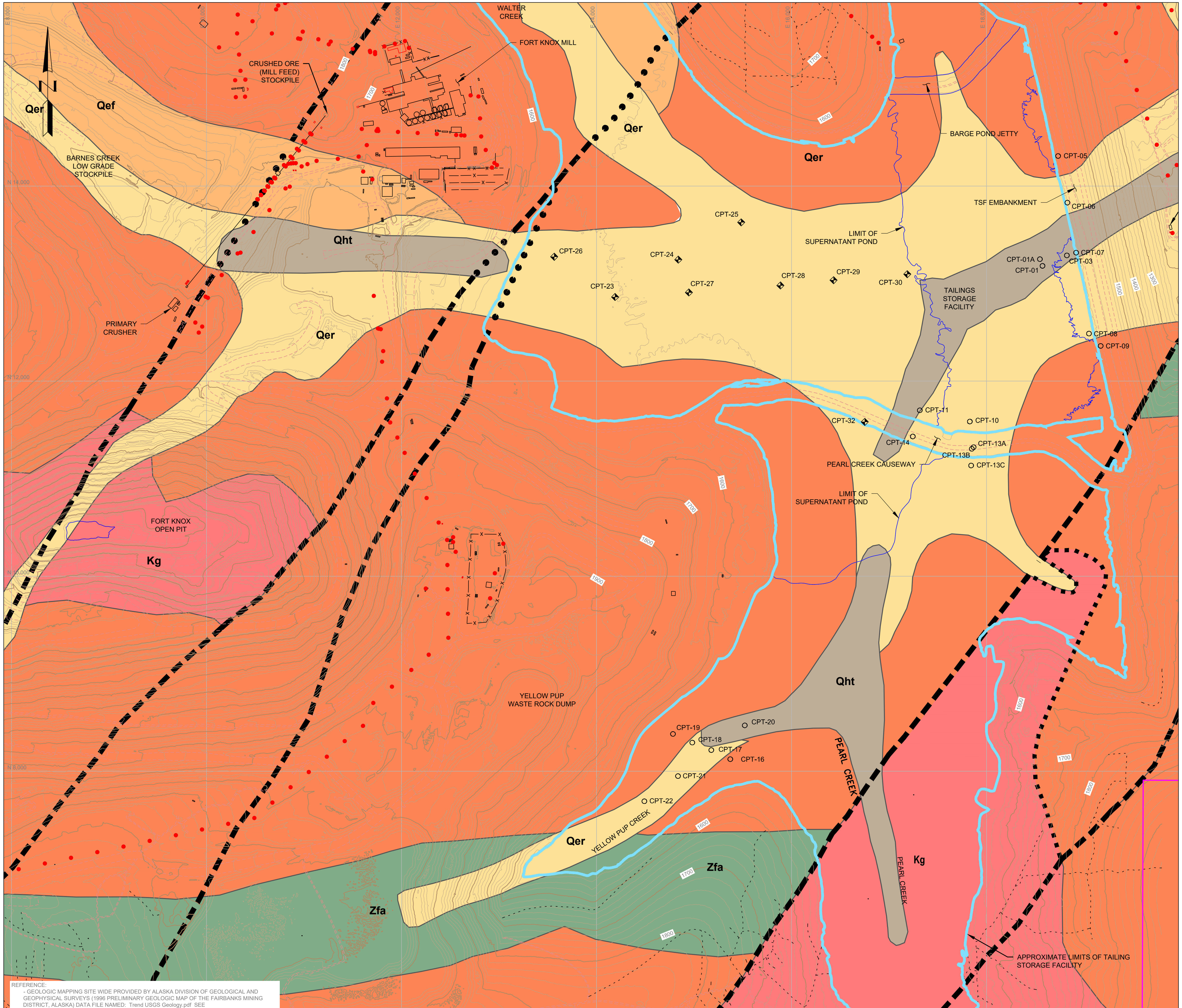

REFERENCE:
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LEGEND:

GROUND SURFACE CONTOUR

CONTACT (APPROXIMATELY LOCATED)

HIGH ANGLE FAULT (DASHED WHERE INFERRED, DOTTED WHERE CONCEALED)

Qht	REWORKED CREEK GRAVEL TAILINGS. PLACER–MINE DREDGE TAILINGS. TAN TO BROWN COLOR GRAVEL WITH COBBLES.
Qef	FAIRBANKS LOESS. MASSIVE, HOMOGENEOUS, UNCONSOLIDATED EOLIAN SILT. MAY INCLUDE RETRANSPORTED DEPOSIT ON SLOPES. WELL SORTED CONTAINING LESS THAN 10 PERCENT CLAY. LOCALLY CEMENTED BY IRON OXIDE AND LOCALLY CALCAREOUS.
Qer	RETRANSPORTED SILT. MASSIVE, HOMOGENEOUS, UNCONSOLIDATED EOLIAN SILT RETRANSPORTED FROM HILLS TO LOWER SLOPES AND VALLEY BOTTOMS. MAY CONTAIN ORGANIC MATERIAL AND OVERLIE TERTIARY GRAVEL IN VALLEY BOTTOMS.
Kg	GRANITE. LIGHT GRAY TO TAN, MEDIUM TO COARSE GRAINED BIOTITE GRANITE. SILICIFICATION RESULTS IN RESISTANT BLOCKY BEDROCK EXPOSURES.
Zf	QUARTZ MUSCOVITE SCHIST, QUARTZITE, AND CHLORITE QUARTZOSE SCHIST. LIGHT TO MEDIUM GRAY, FINE GRAINED, QUARTZITE, QUARTZ MUSCOVITE SCHIST, AND GARNET BIOTITE QUARTZ MUSCOVITE SCHIST. MODERATELY RESISTANT DUE TO ITS RELATIVELY HIGH QUARTZ CONTENT.
Zfa	AMPHIBOLITE, MAGNETITE RICH BIOTITE SCHIST, QUARTZOSE SCHIST, AND MARBLE. HETEROGENEOUS UNIT OF VARIABLY COLORED, GRAY TO GREEN, FINE TO COARSE GRAINED, GARNET HORNBLENDE AMPHIBOLITE, MAGNETITE BEARING BIOTITE SCHIST, COARSELY CRYSTALLINE MARBLE, AND LIGHT GRAY, MICA–RICH QUARTZITE.

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

500 0 500 1000 FEET

1"=500' AT FULL SIZE (ANSI D)
1"=1000' AT HALF SIZE (ANSI B)

PROJECT
FORT KNOX PROJECT
FISH CREEK EAST WASTE ROCK DUMP

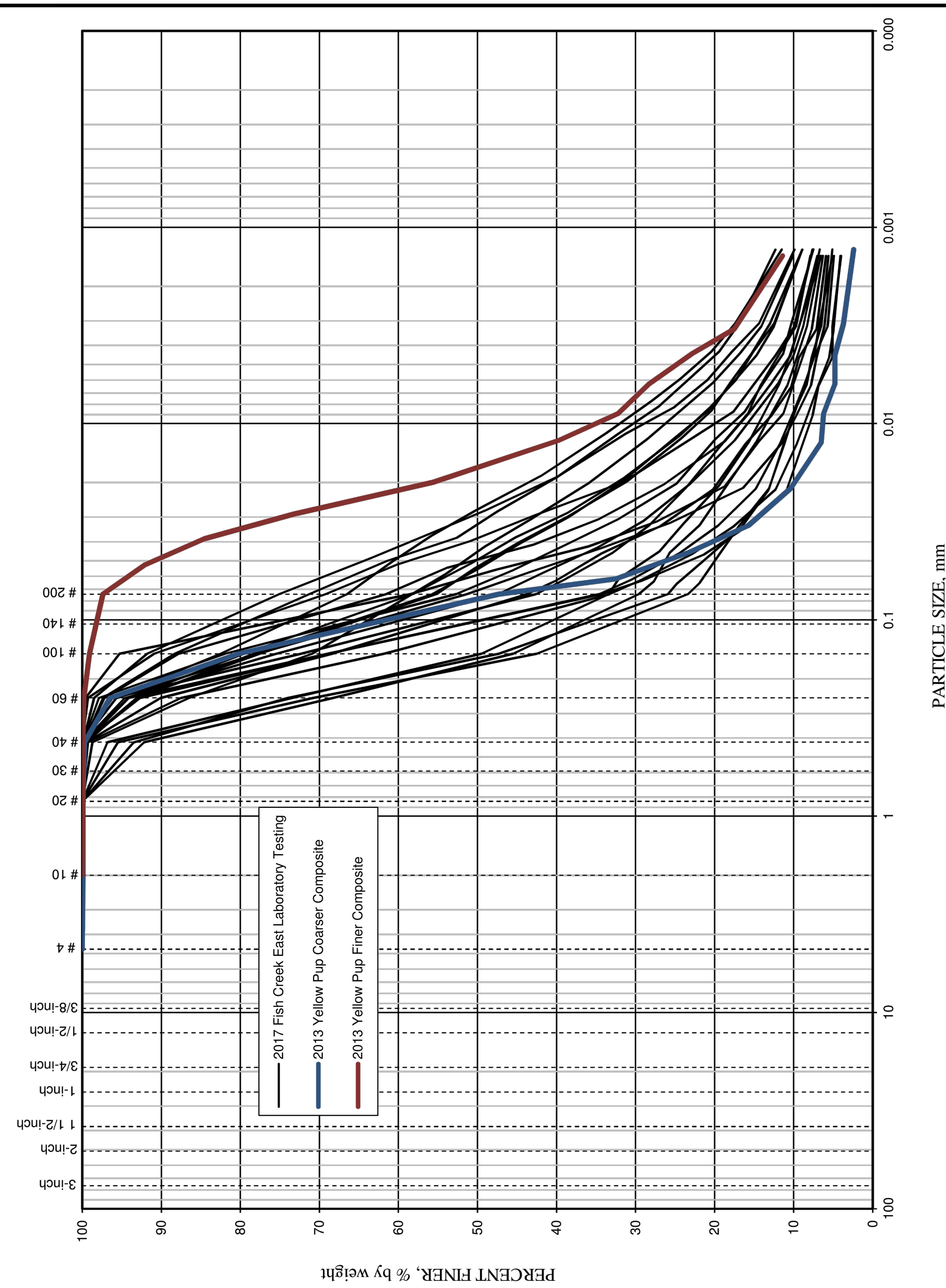
TITLE
GEOLOGIC MAP

CLIENT
FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	PD	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	CB	DV101	00336.08	2.1	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: \\knightpiesold.local\USADFS\Denver\Projects\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG2.1_GeologicMap.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 4:01 PM



PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	TAILING GRADATION CURVES
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.1	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.1_TailingGradationCurves.dwg
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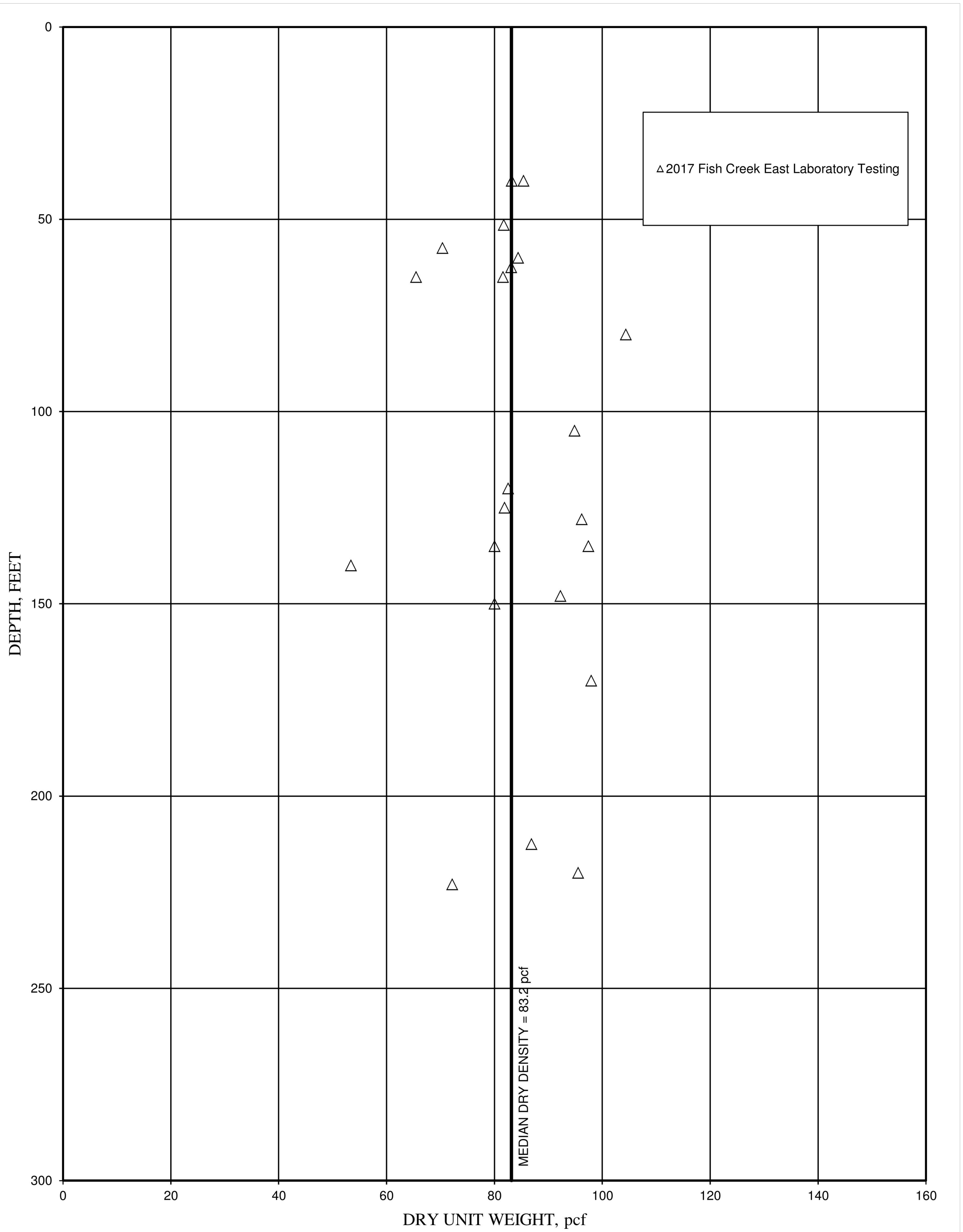

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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.2_DryUnitWeight.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 5:08 PM

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	TAILING DRY UNIT WEIGHT PROFILES
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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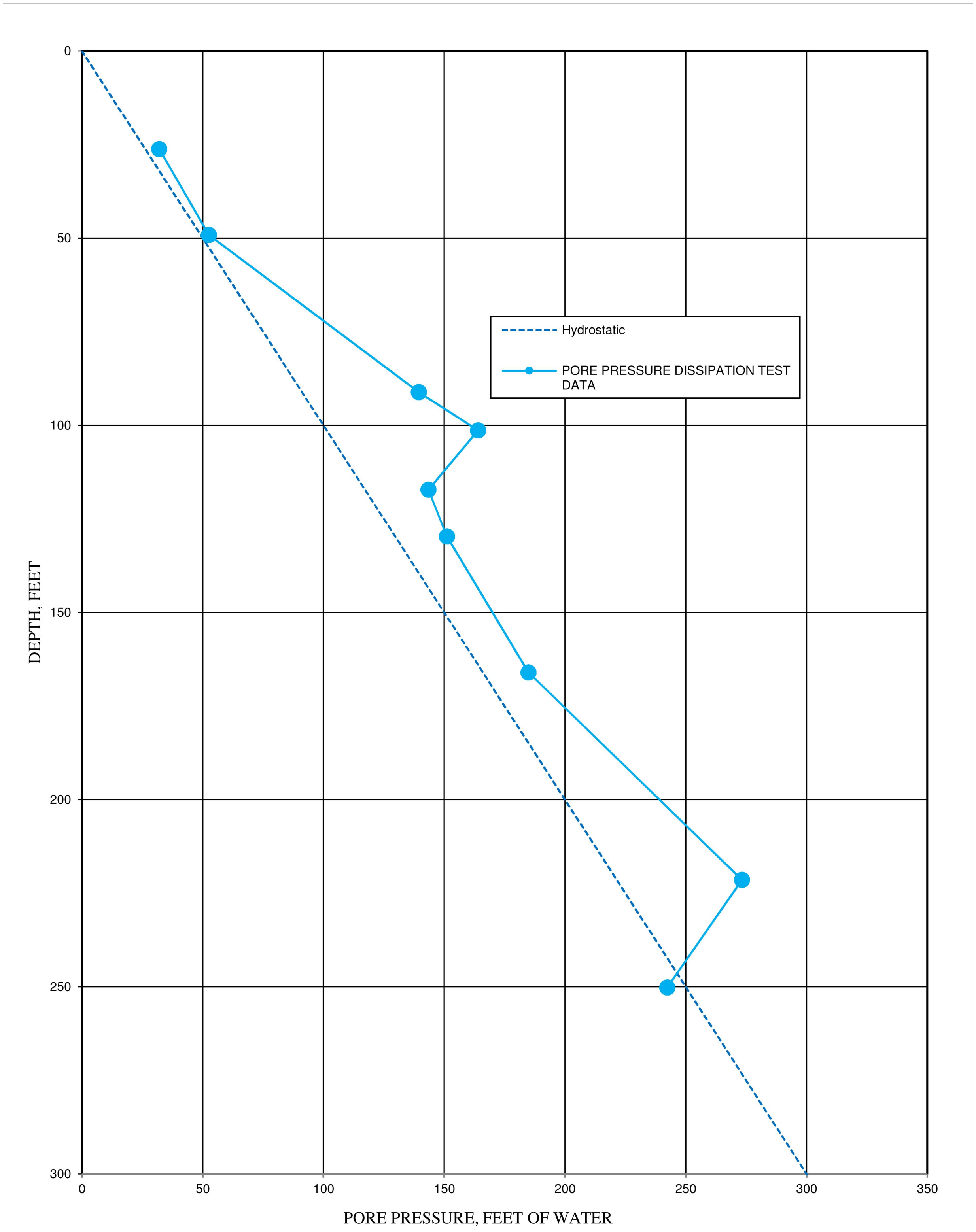
ACTIVITY CODE	N/A	XREF NUMBER	N/A		



PROJECT
FORT KNOX PROJECT
FISH CREEK EAST WASTE ROCK DUMP

TITLE
CPT-23 PORE WATER PRESSURE PROFILE

CLIENT
FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.3	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.3_cpt23ppd.dwg
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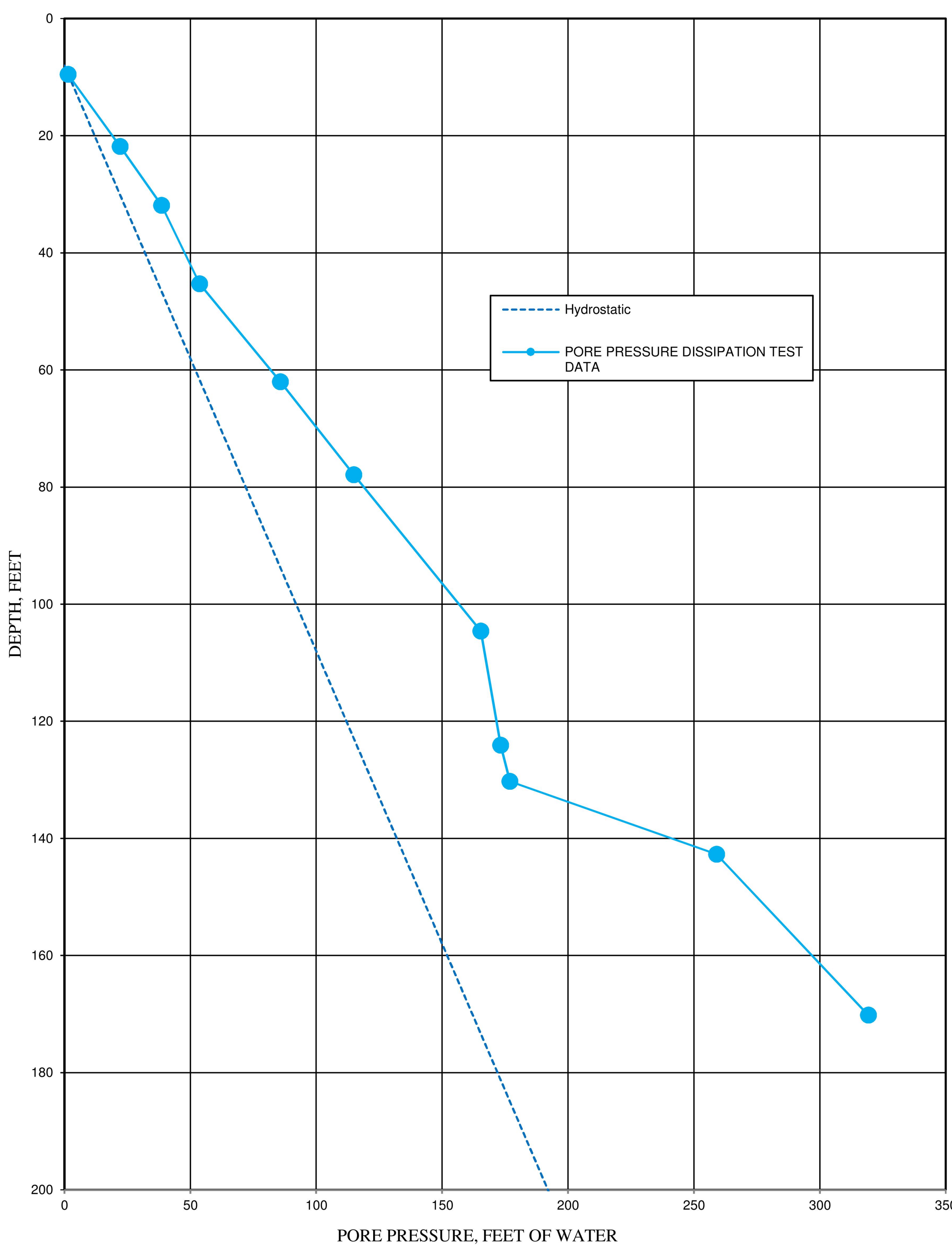

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	CPT-24 PORE WATER PRESSURE PROFILE
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.4	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.4_cpt24ppd.dwg
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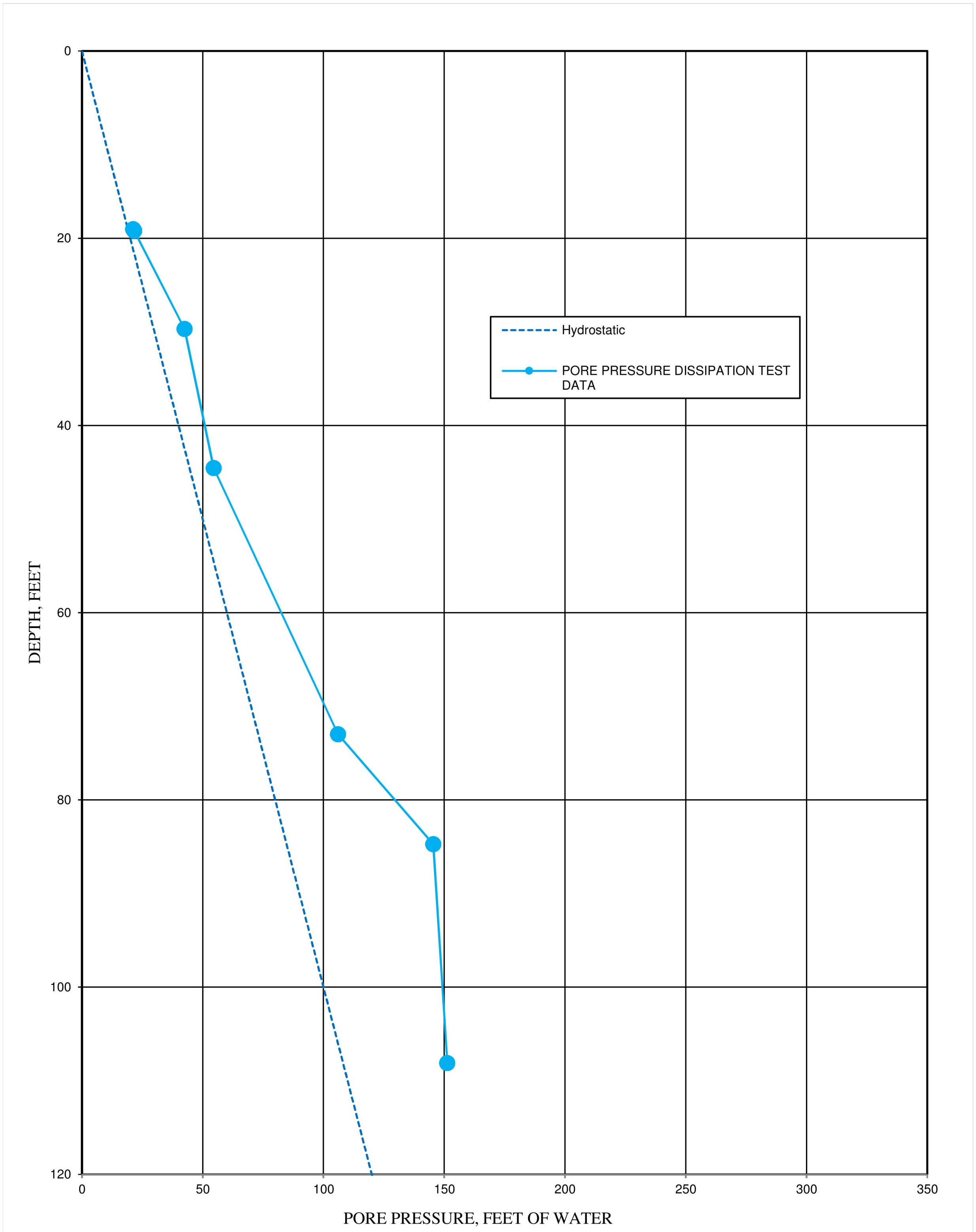

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	CPT-25 PORE WATER PRESSURE PROFILE
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.5	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.5_cpt25ppd.dwg
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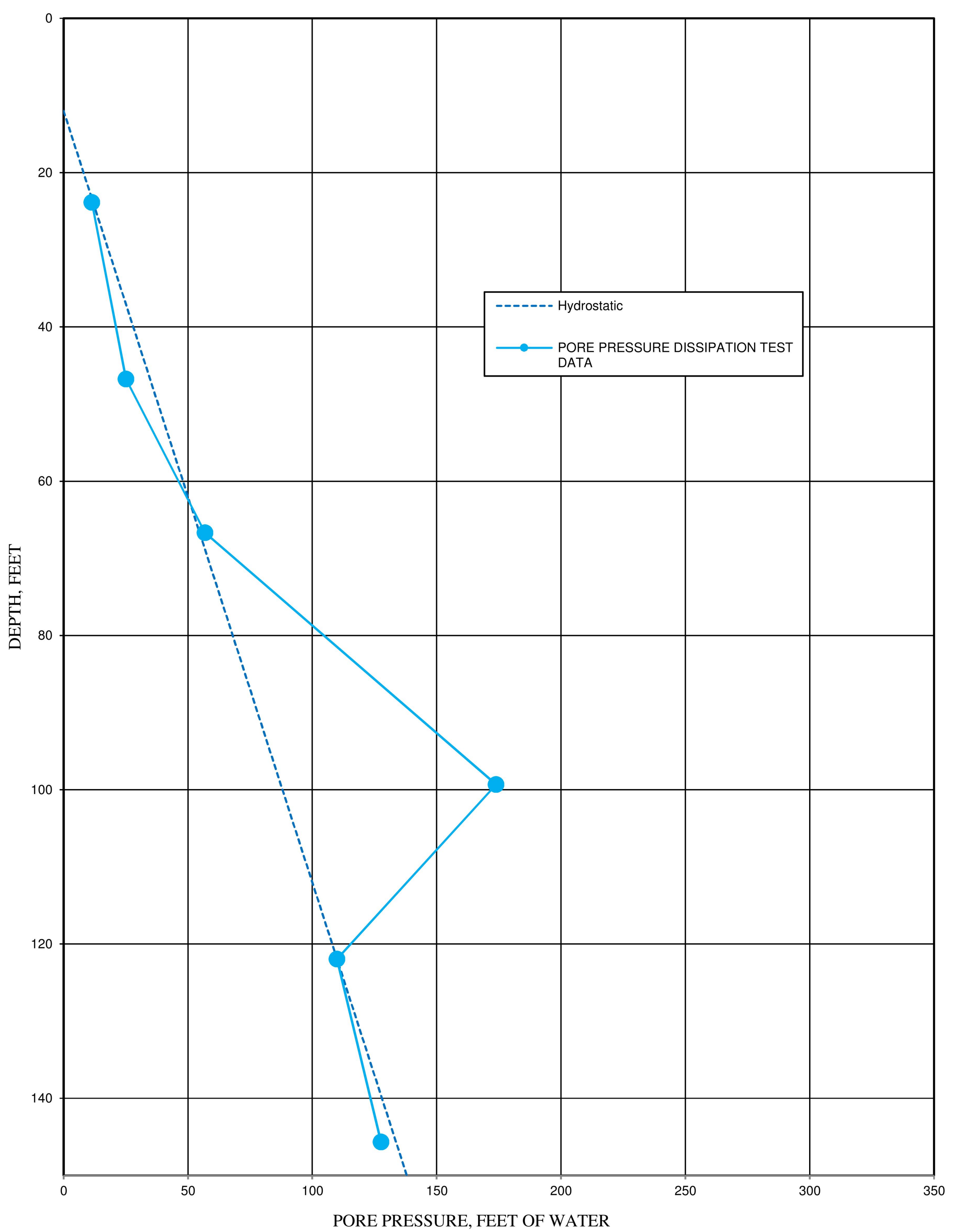

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	CPT-26 PORE WATER PRESSURE PROFILE
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.6	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.6_cpt26ppd.dwg
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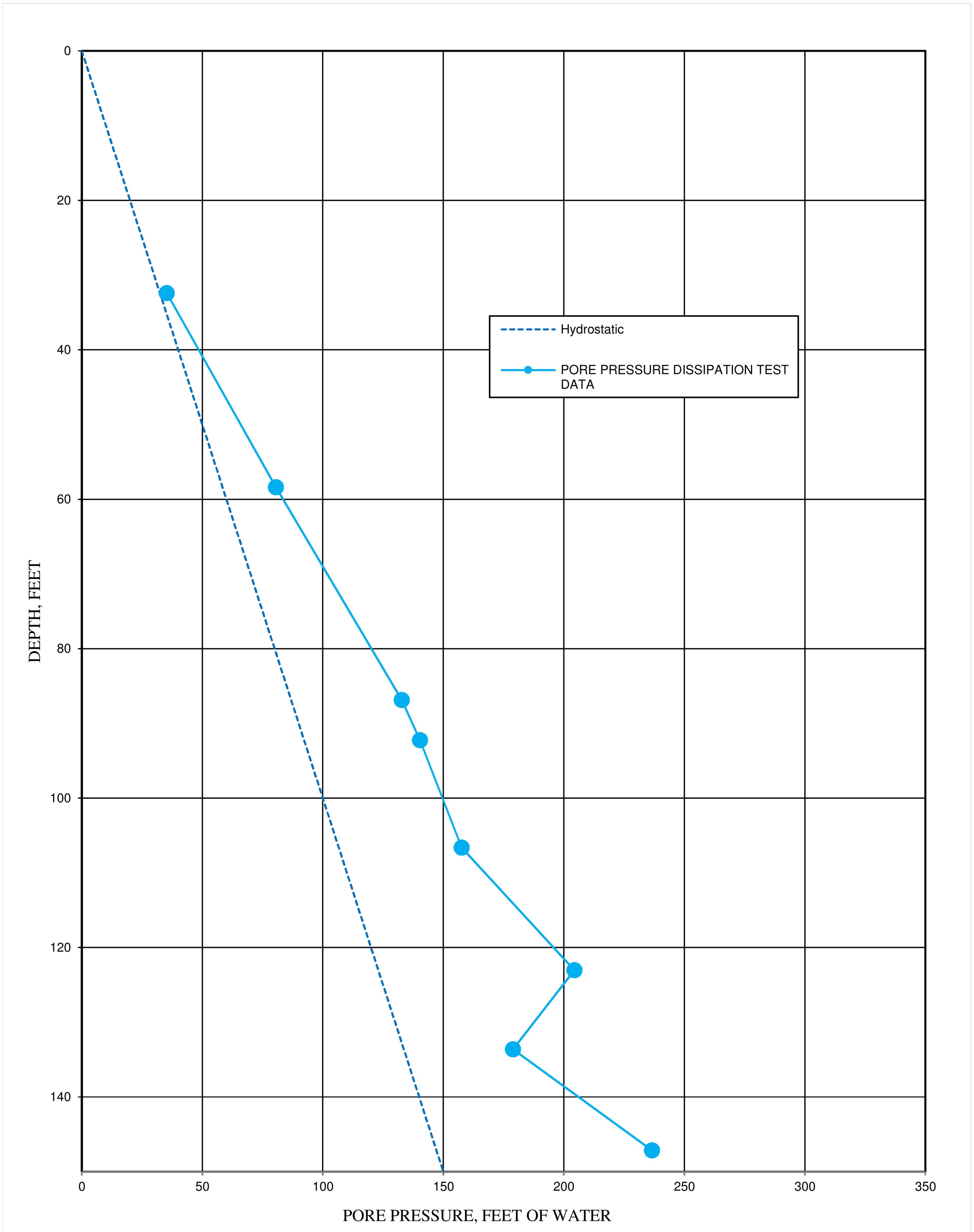

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP				
TITLE	CPT-27 PORE WATER PRESSURE PROFILE				
CLIENT	FAIRBANKS GOLD MINING, INC.				
	Knight Piésold CONSULTING				
DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.7	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.7_cpt27ppd.dwg
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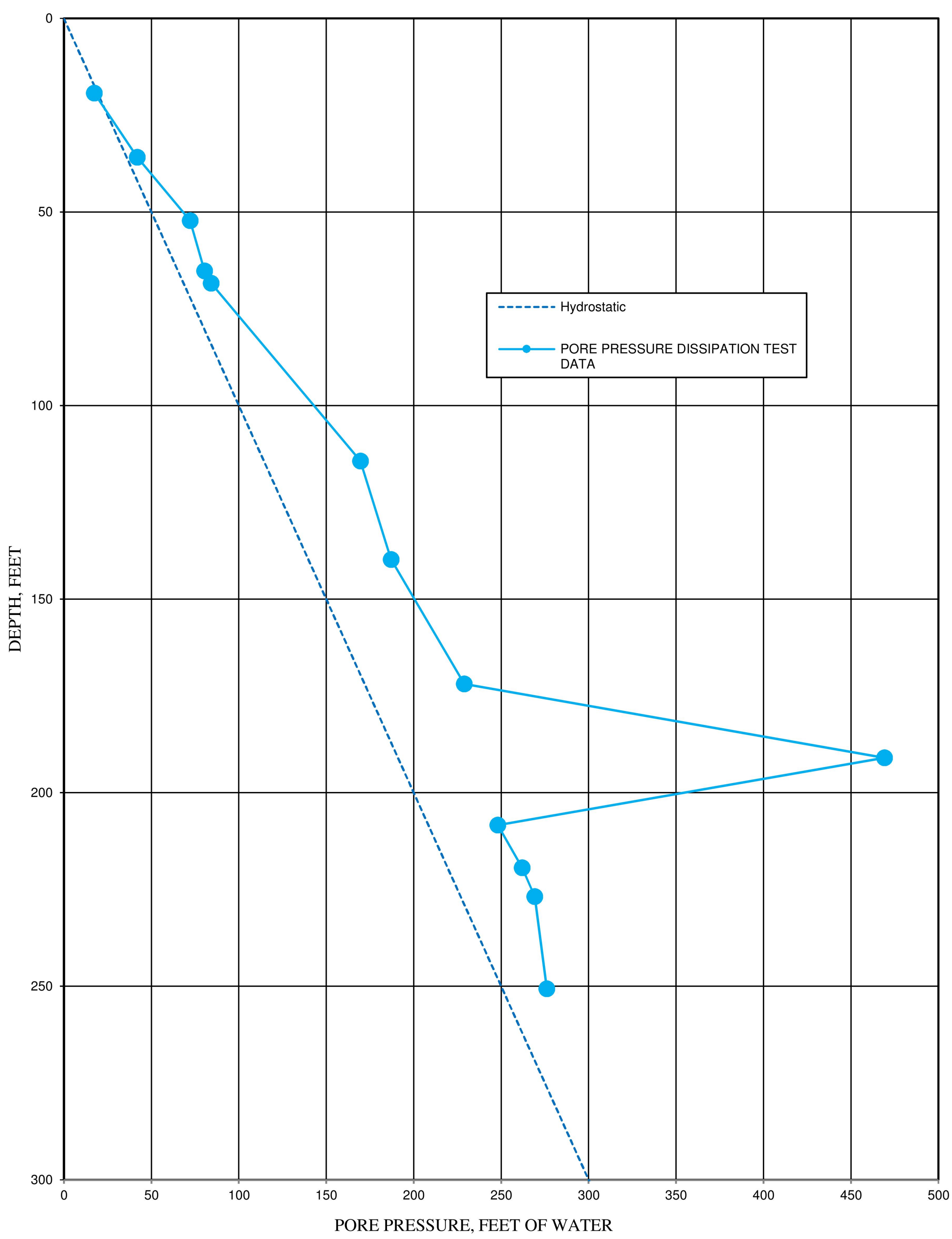

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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.8_cpt28ppd.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 5:09 PM

PROJECT
FORT KNOX PROJECT
FISH CREEK EAST WASTE ROCK DUMP

TITLE
CPT-28 PORE WATER PRESSURE PROFILE

CLIENT
FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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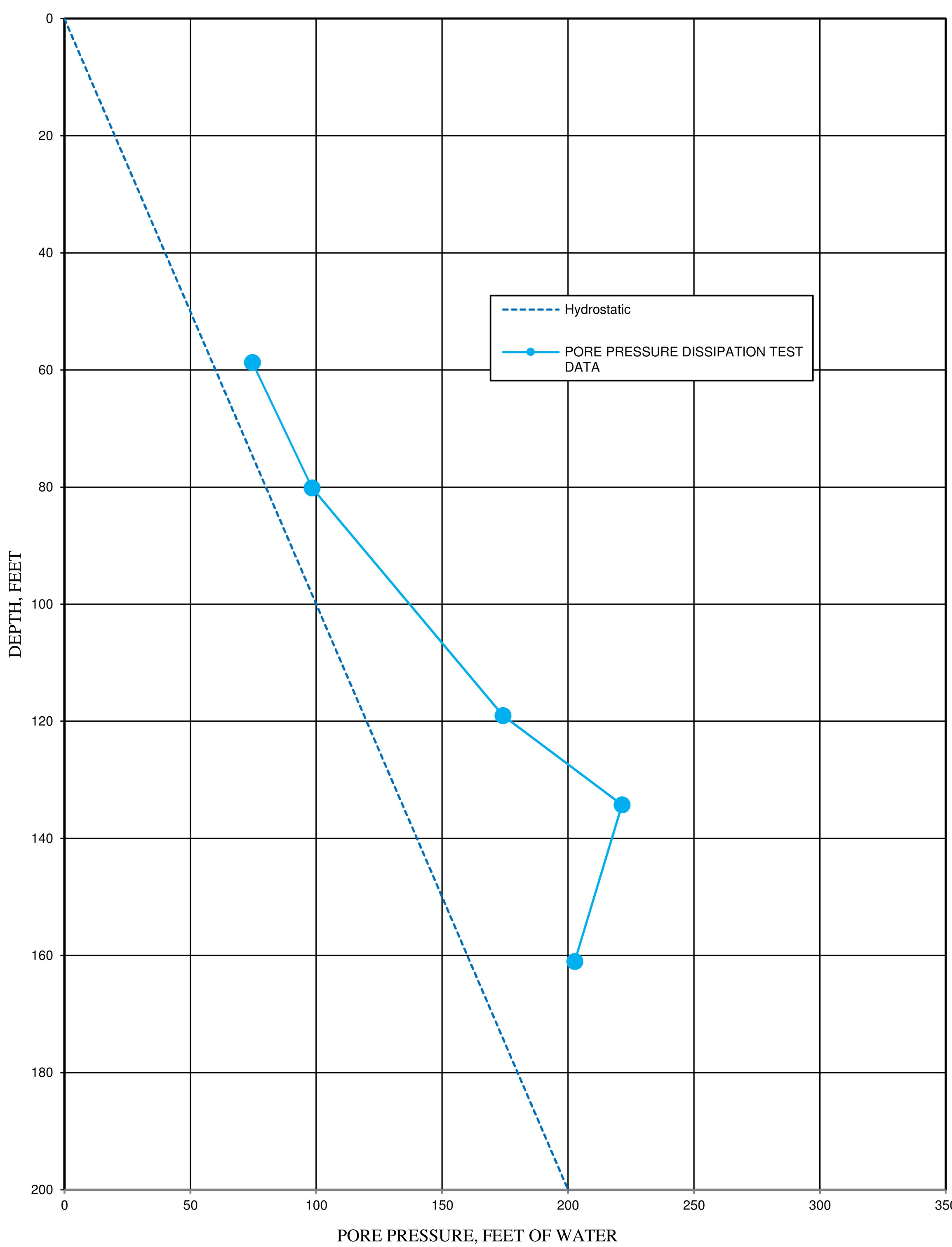
ACTIVITY CODE	N/A	XREF NUMBER	N/A		



PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	CPT-29 PORE WATER PRESSURE PROFILE
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.9	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.9_cpt29ppd.dwg
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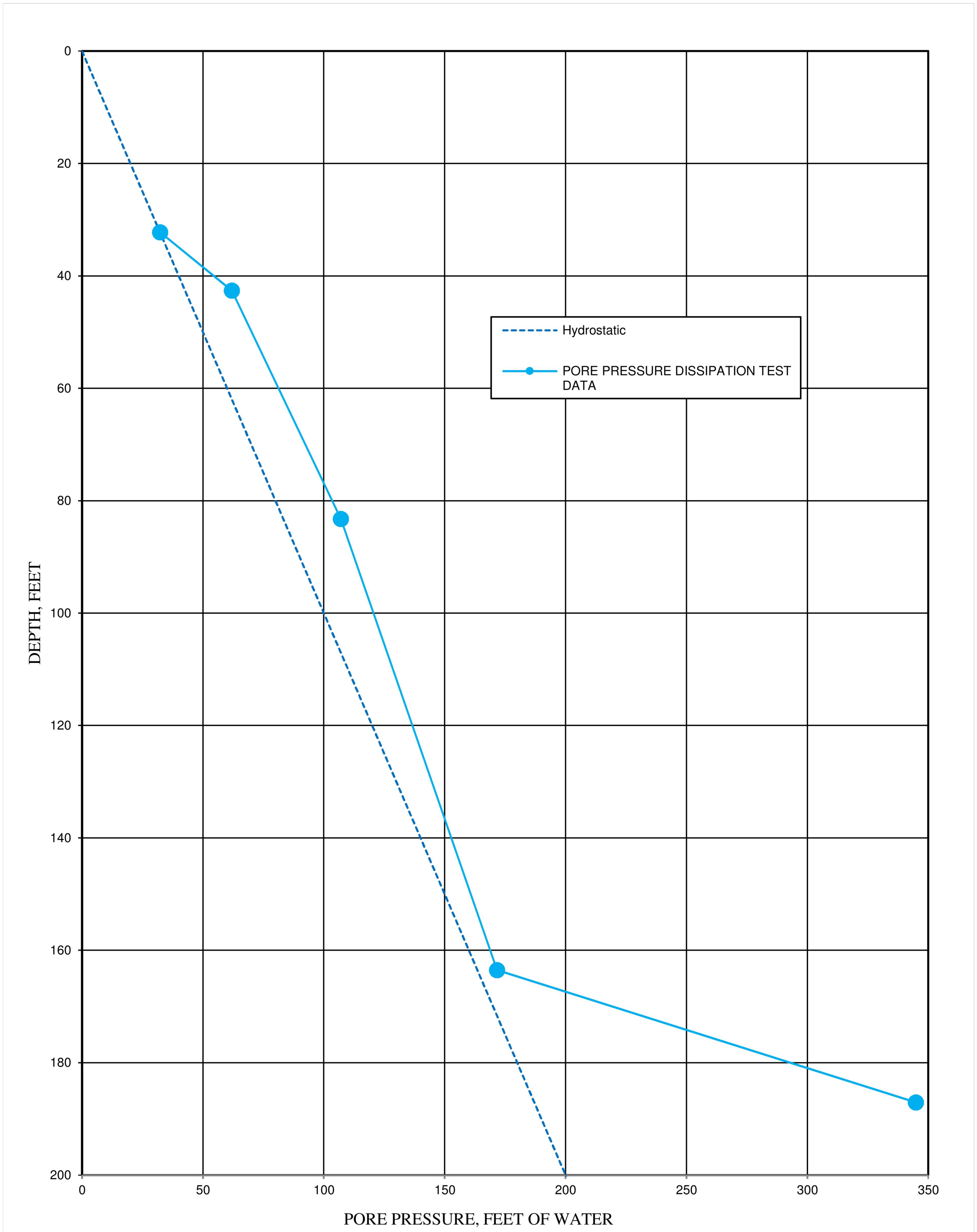

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP			
TITLE	CPT-30 PORE WATER PRESSURE PROFILE			
CLIENT	FAIRBANKS GOLD MINING, INC.			
	Knight Piésold CONSULTING			
DESIGNED BY: JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY: JS	DV101	00336.08	3.10	0
ACTIVITY CODE: N/A	XREF NUMBER: N/A			

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.10_cpt30ppd.dwg
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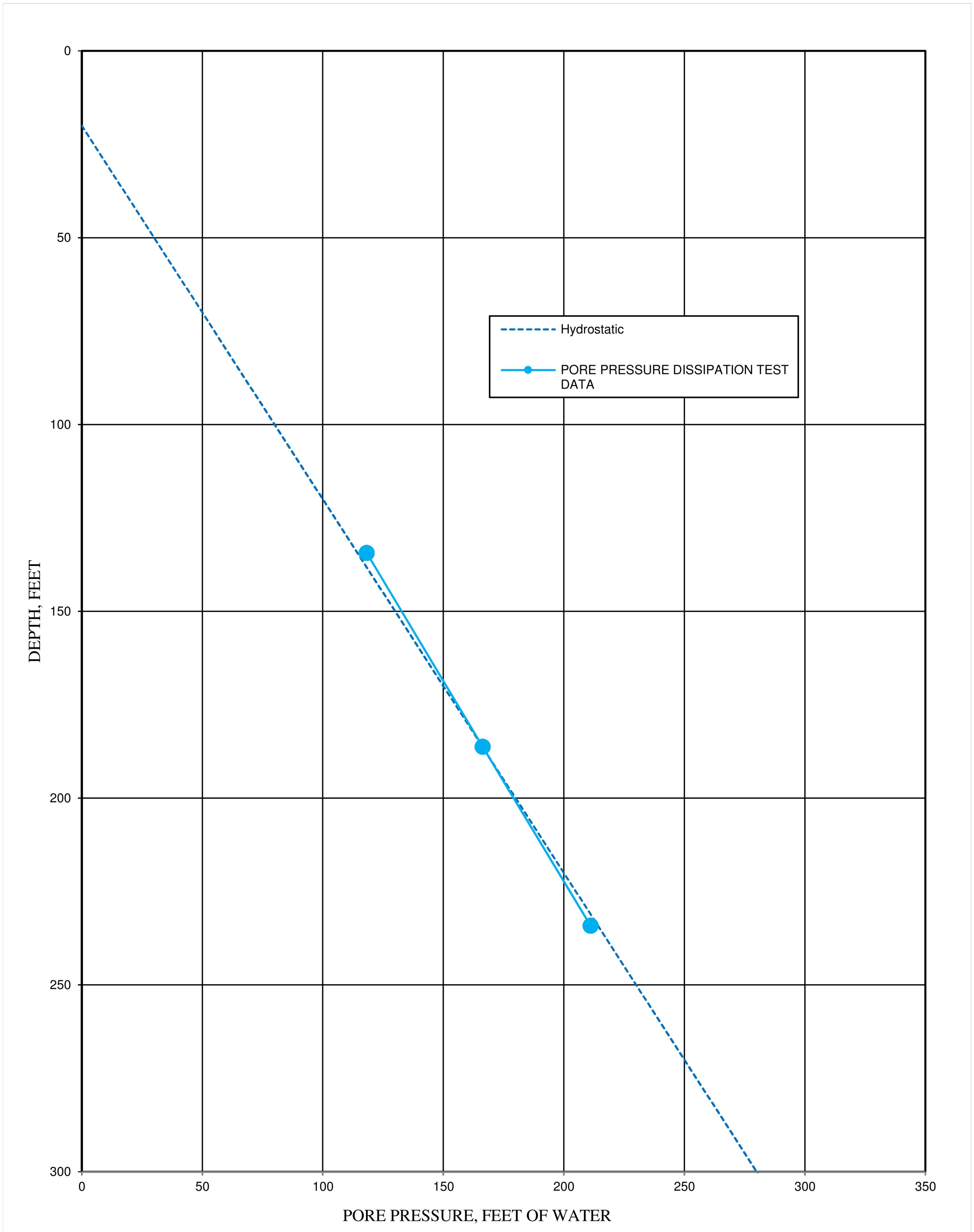

PROJECT
FORT KNOX PROJECT
FISH CREEK EAST WASTE ROCK DUMP

TITLE
CPT-32 PORE WATER PRESSURE PROFILE

CLIENT
FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.11_cpt32ppd.dwg
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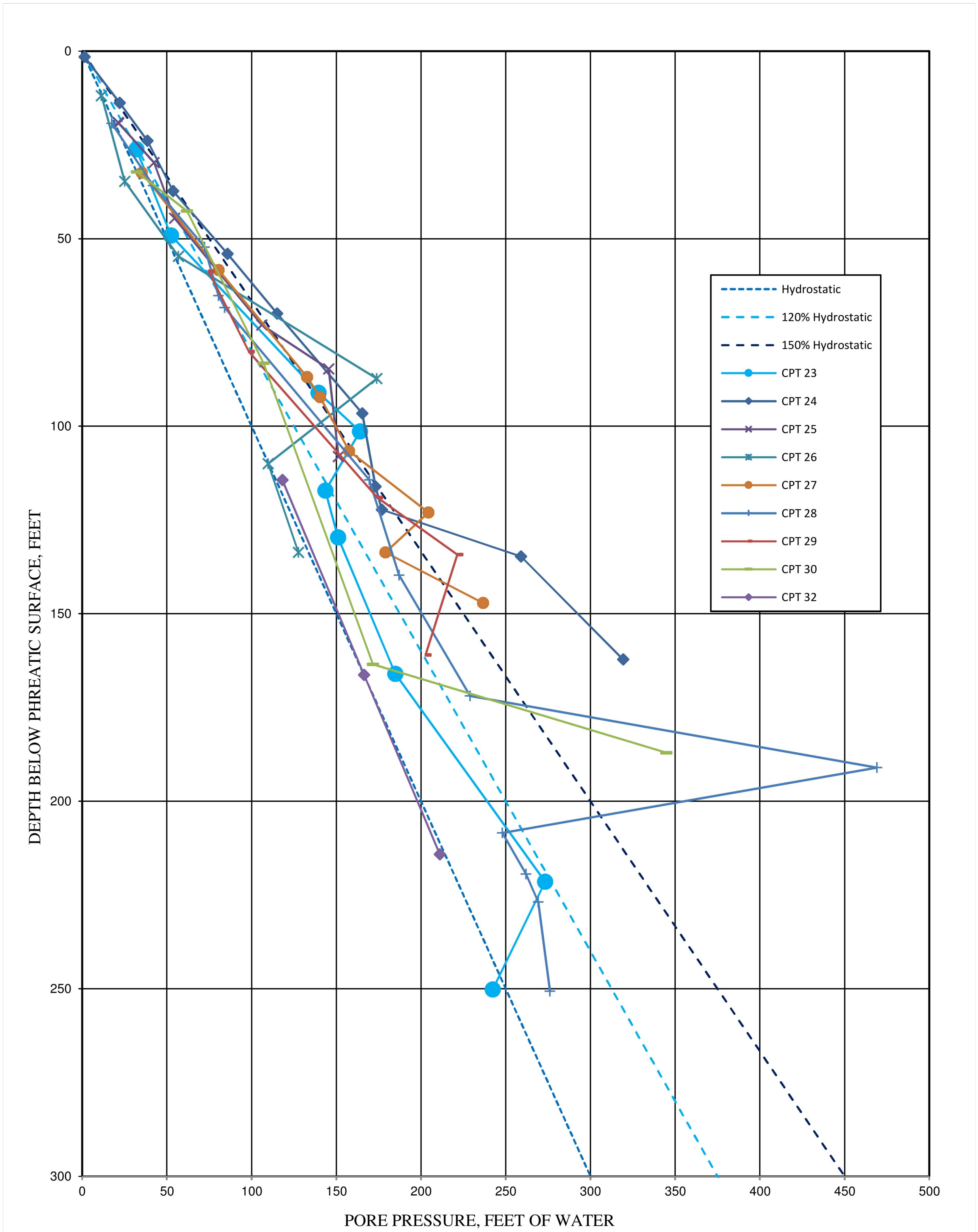

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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.12_AllPPDProfile.dwg
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PROJECT
FORT KNOX PROJECT
FISH CREEK EAST WASTE ROCK DUMP

TITLE
PORE WATER PRESSURE SUMMARY

CLIENT
FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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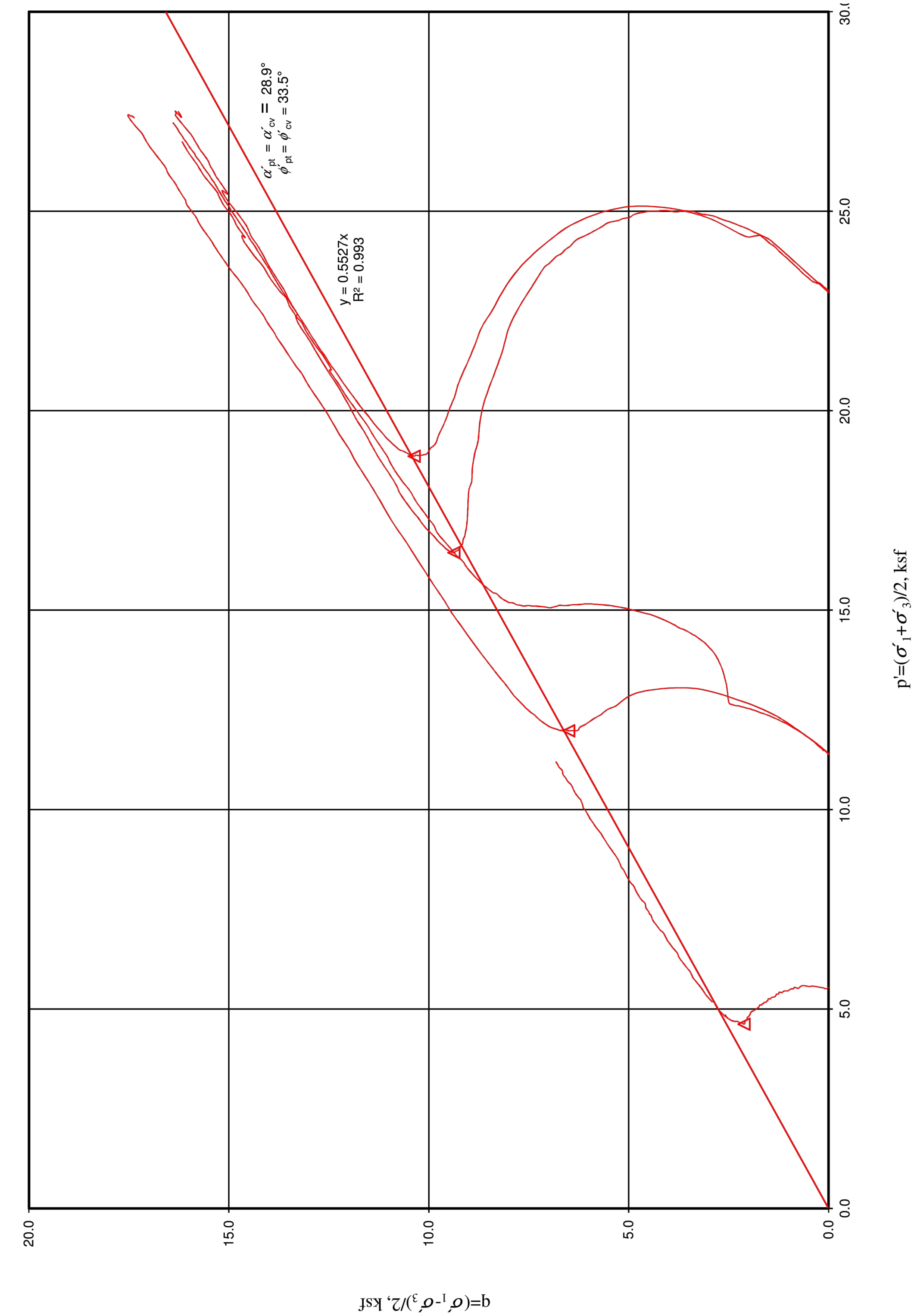
ACTIVITY CODE	N/A	XREF NUMBER	N/A		



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DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.13triaxial.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 5:10 PM

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	YELLOW PUP COARSER TAILING TRIAXIAL SHEAR STRENGTH TESTING STRESS PATHS
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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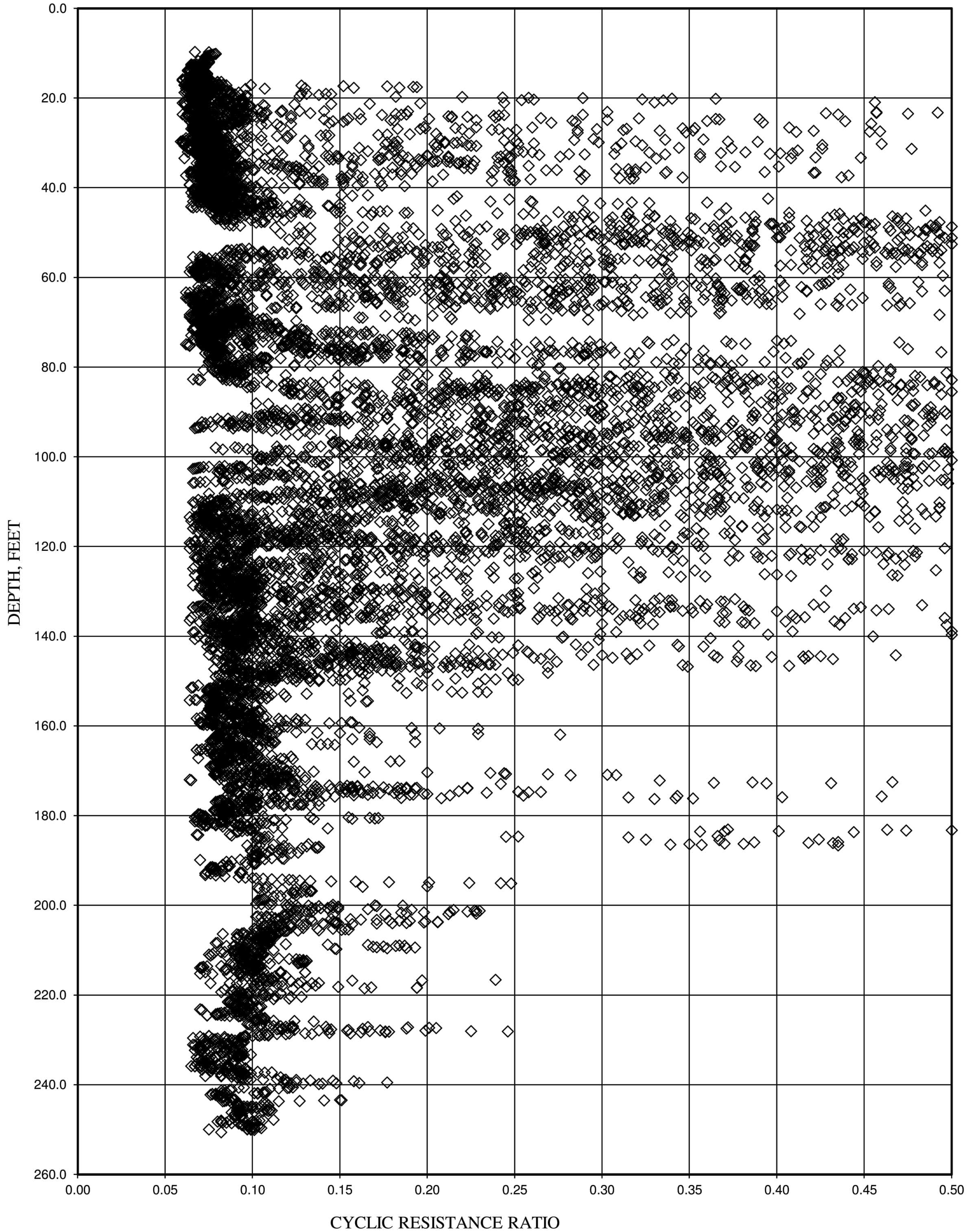
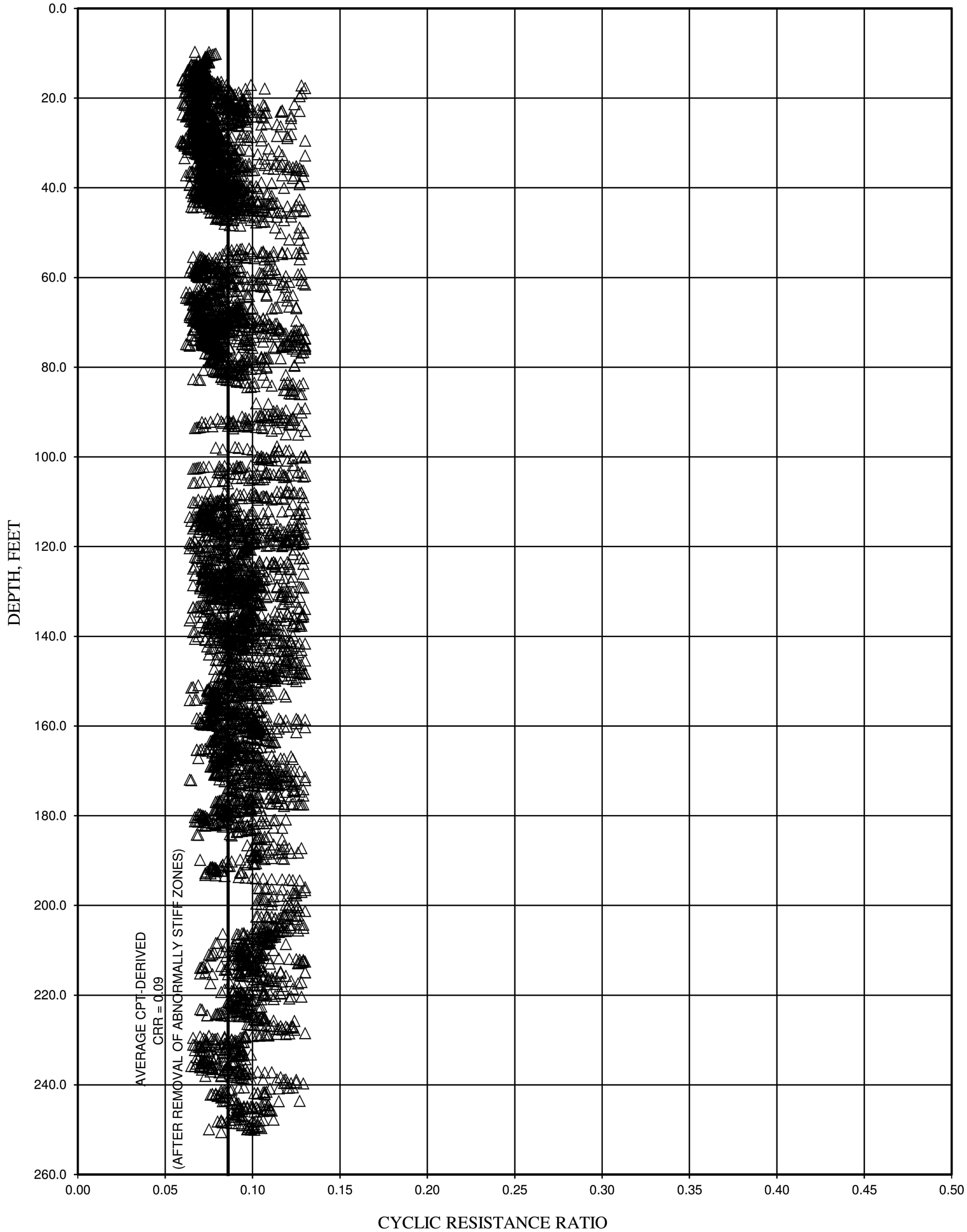


PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	CYCLIC RESISTANCE RATIO PROFILE
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.14	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.14_AllCRR.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 5:10 PM



PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	CYCLIC RESISTANCE RATIO PROFILE AFTER REMOVAL OF STIFF ZONES
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.15	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.15_SelectCRR.dwg
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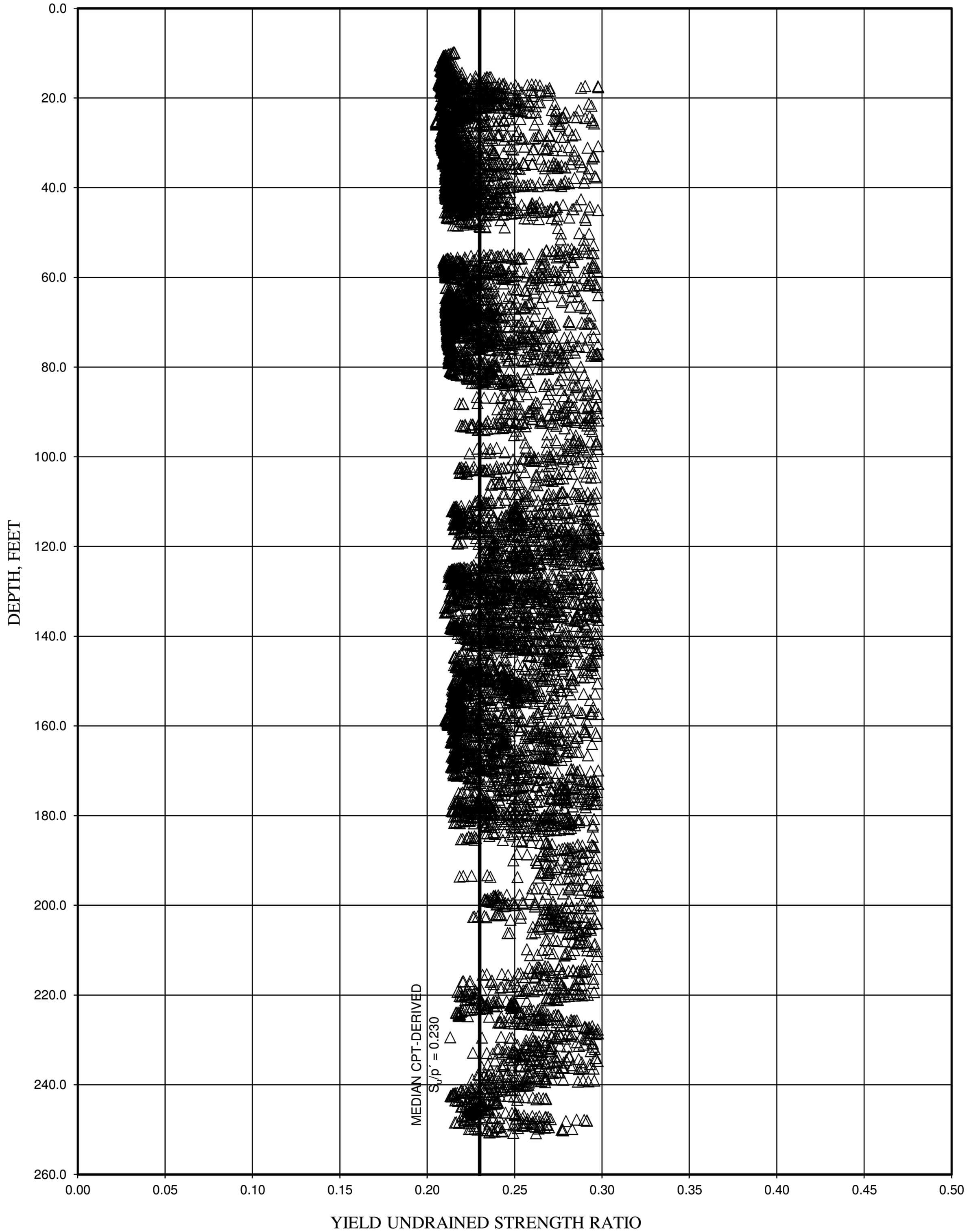
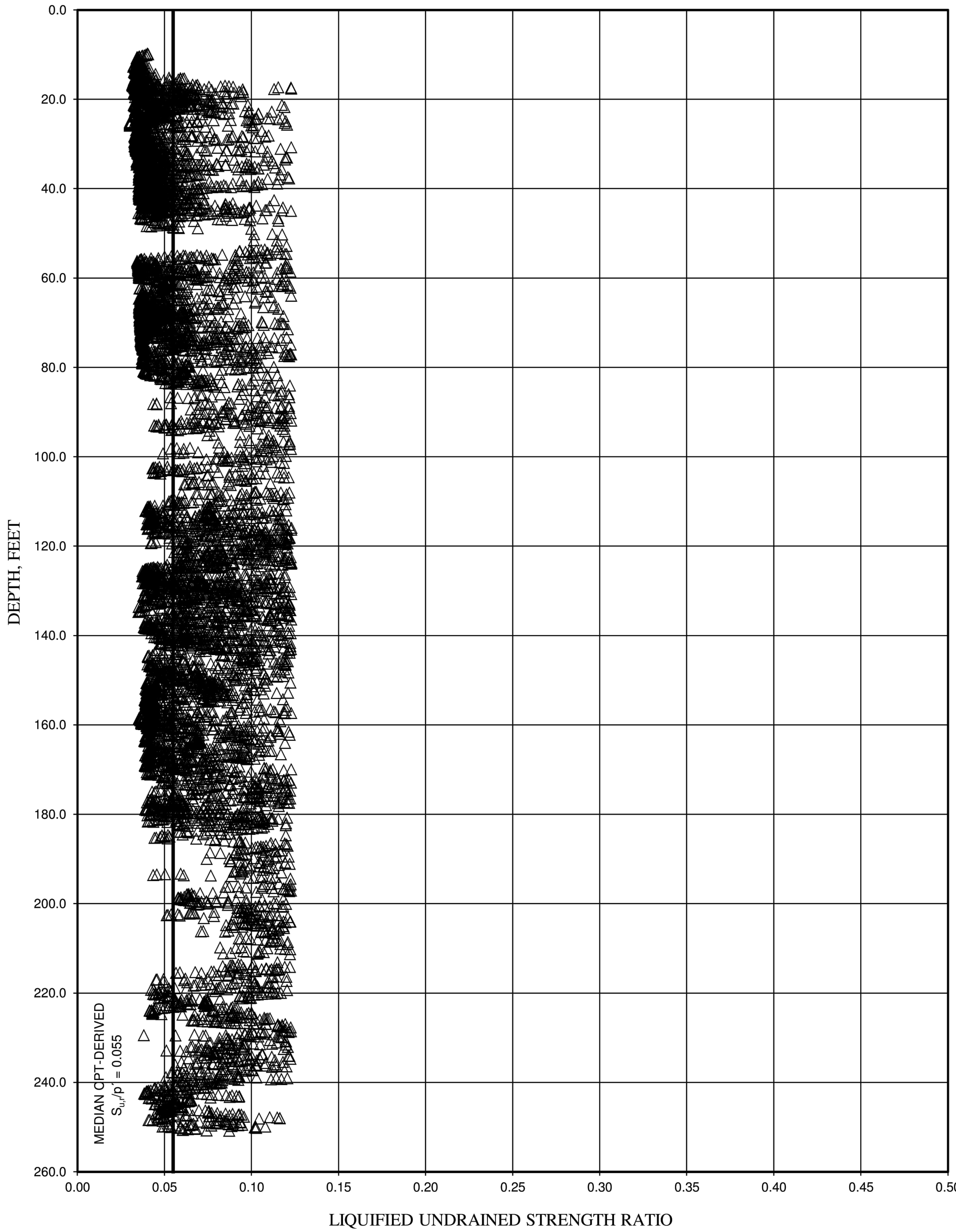


PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	TAILING CPT-DERIVED YIELD UNDRAINED SHEAR STRENGTH RATIOS
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.16	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.16_YieldStrengthRatio.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 5:10 PM



PROJECT
FORT KNOX PROJECT
FISH CREEK EAST WASTE ROCK DUMP

TITLE
TAILING CPT-DERIVED YIELD
LIQUEFIED SHEAR STRENGTH RATIOS

CLIENT
FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.17	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.17_ResidualStrengthRatio.dwg
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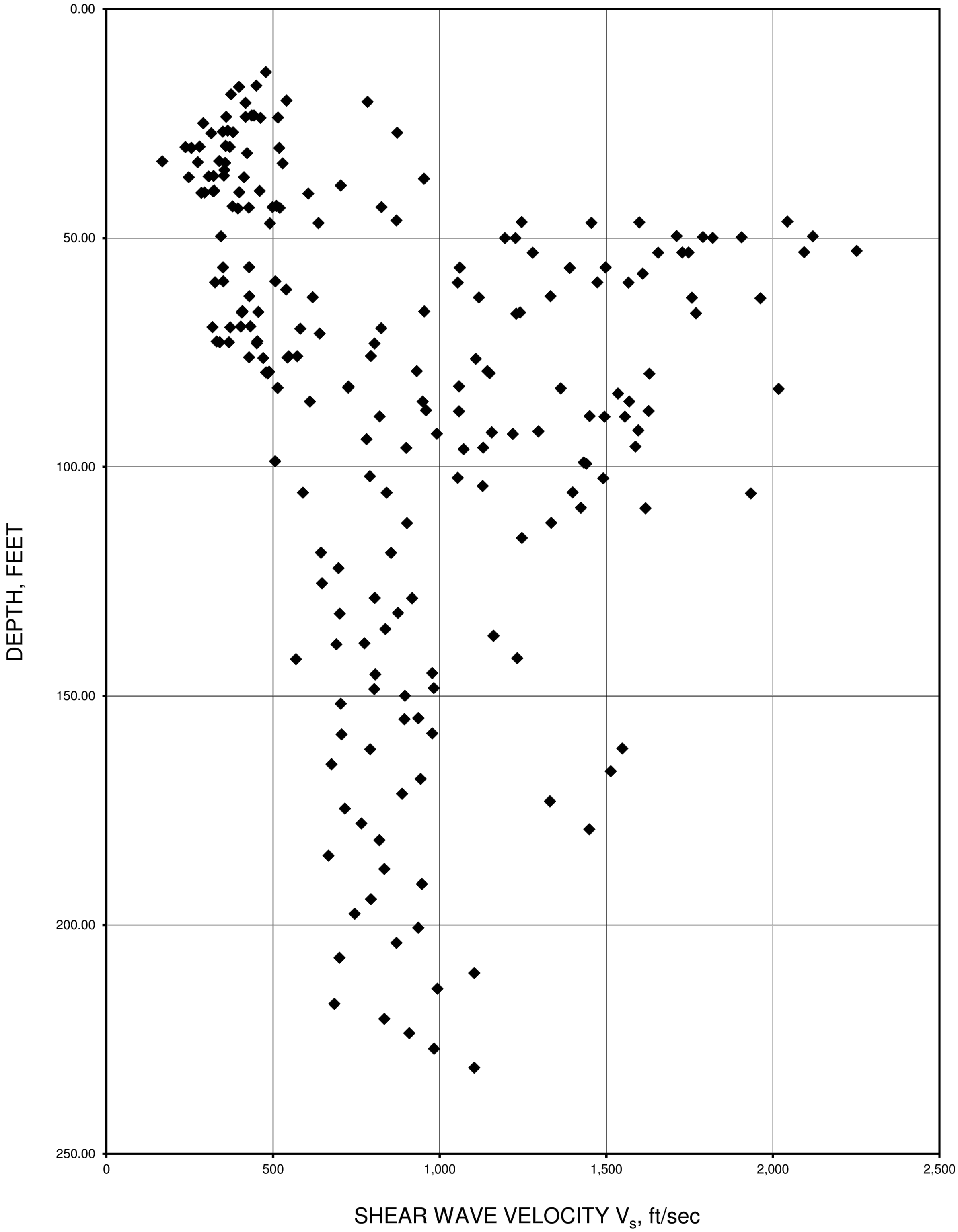
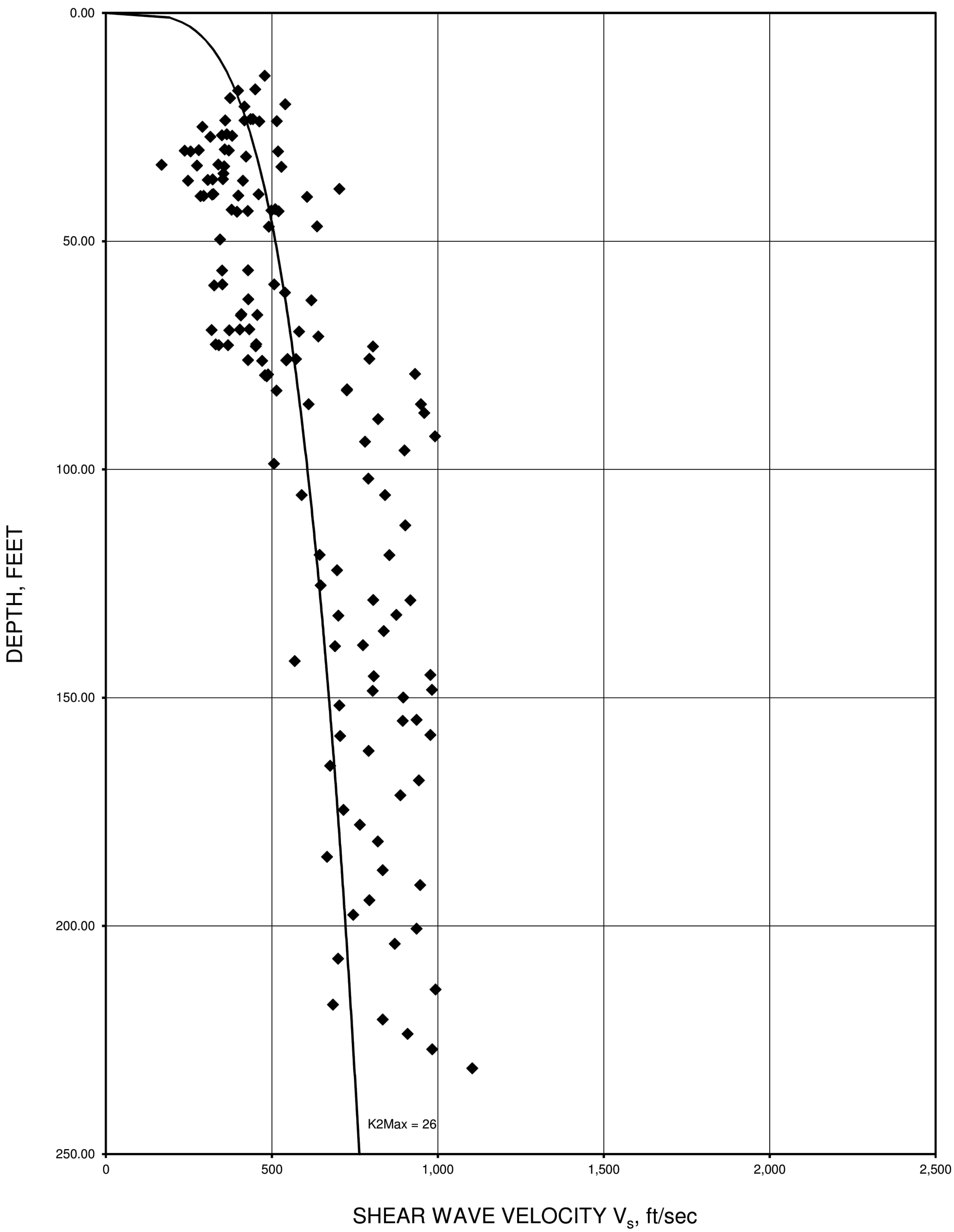


PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP			
TITLE	TAILING SHEAR WAVE VELOCITY MEASUREMENTS			
CLIENT	FAIRBANKS GOLD MINING, INC.			

Knight Piésold
CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.18	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.18_AllShearWave.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 5:10 PM



PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	TAILING SHEAR WAVE VELOCITY PROFILE WITH STIFF ZONES REMOVED
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JS	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	JS	DV101	00336.08	3.19	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: CBEANLAND
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.19_SelectShearWave.dwg
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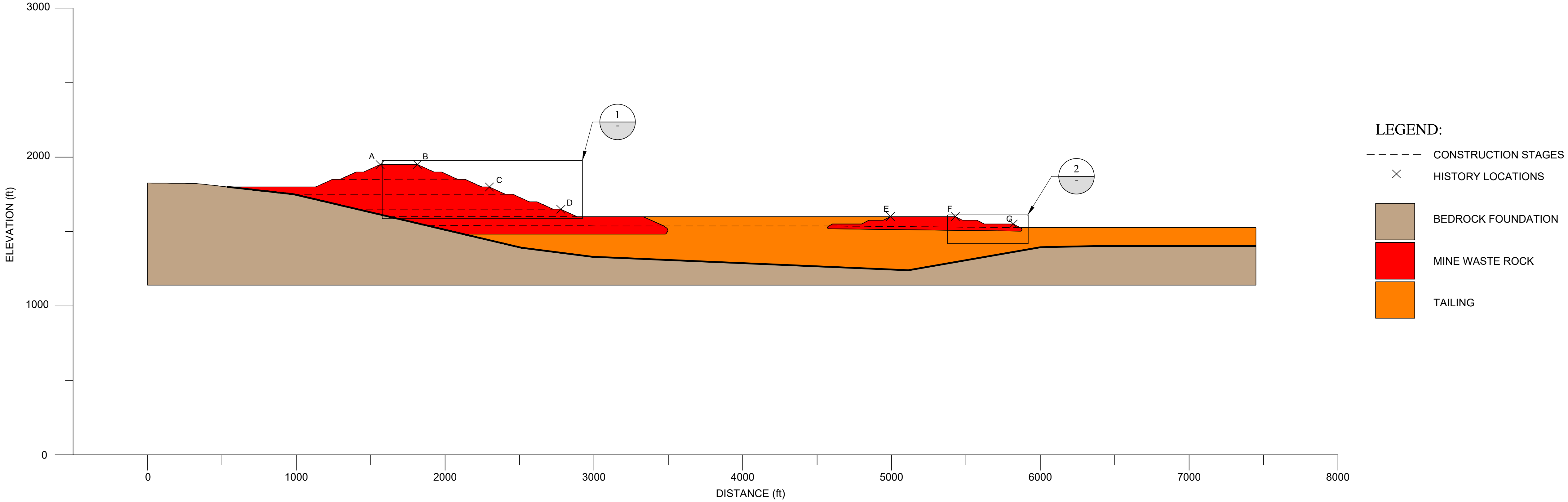
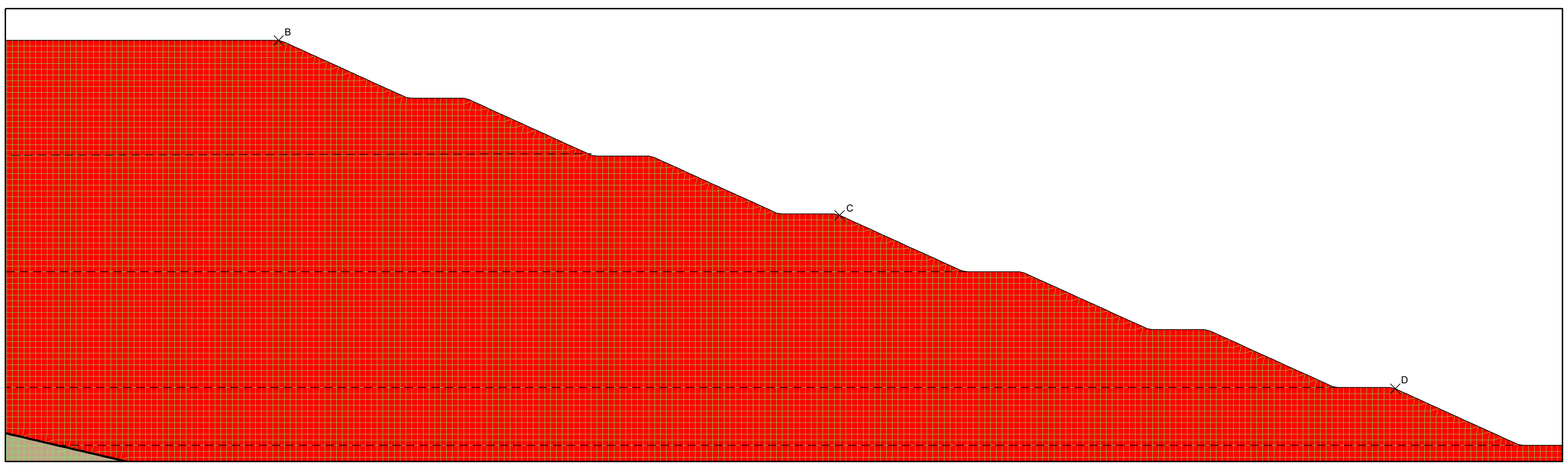
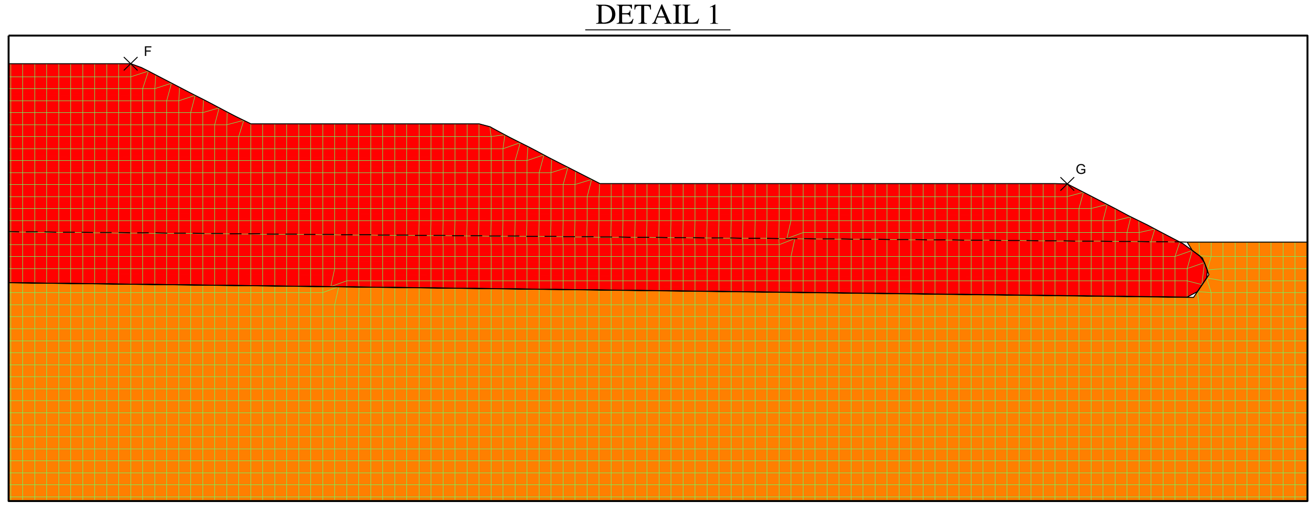




DETAIL 1



DETAIL 2

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP				
TITLE	SECTION A FINITE DIFFERENCE MESH AND MATERIAL ZONES				
CLIENT	FAIRBANKS GOLD MINING, INC.				
Knight Piésold CONSULTING					
DESIGNED BY: JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION	
DRAWN BY: ET	DV101	00336.08	3.20	0	
ACTIVITY CODE: N/A	XREF NUMBER: N/A				

LAST SAVED BY: RSAUER
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.20.dwg
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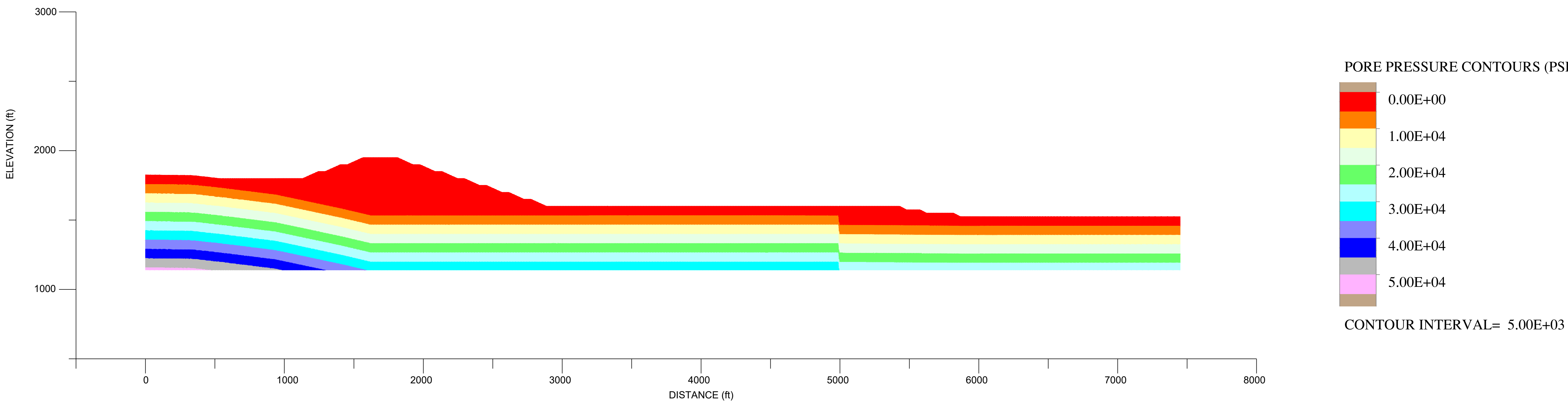
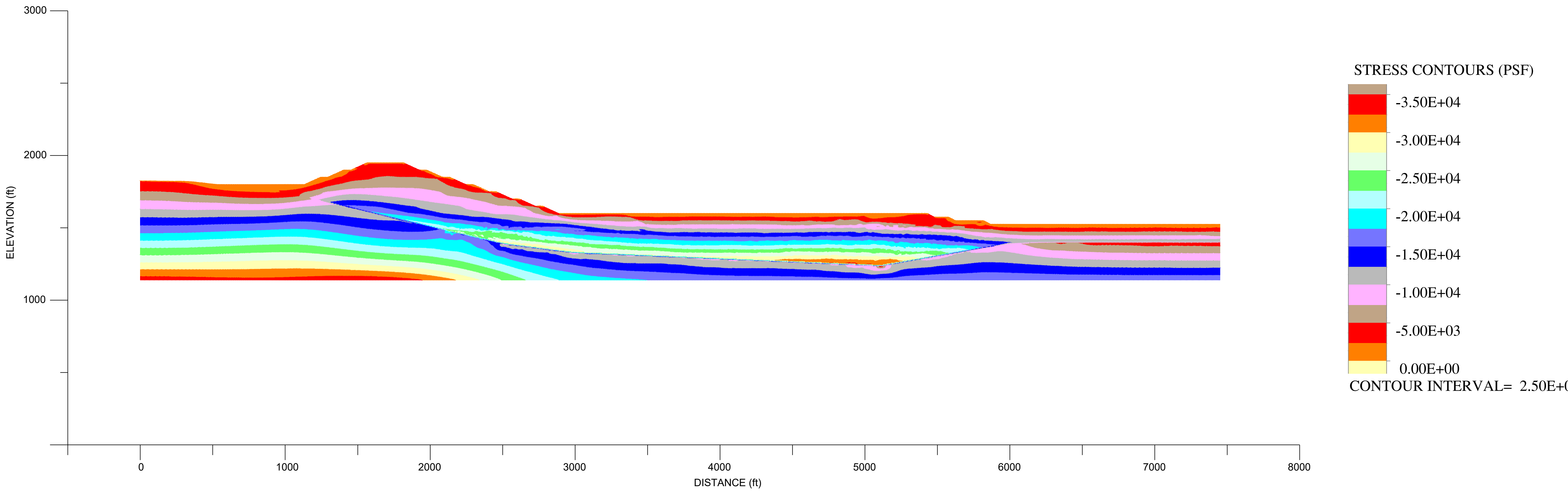


PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION A INTIAL PORE WATER PRESSURE
CLIENT	FAIRBANKS GOLD MINING, INC.

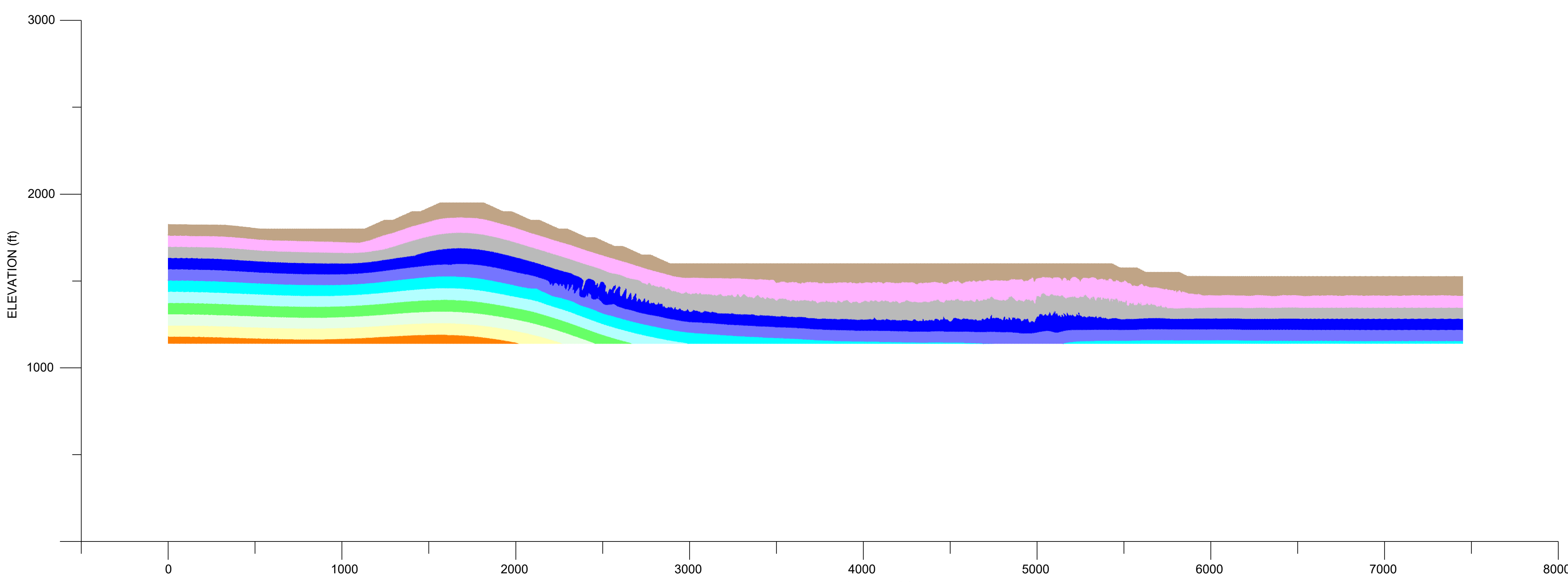
Knight Piésold
CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	ET	DV101	00336.08	3.21	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.21.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 5:12 PM



HORIZONTAL



VERTICAL

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION A INITIAL TOTAL STRESS
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	ET	DV101	00336.08	3.22	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.22.dwg
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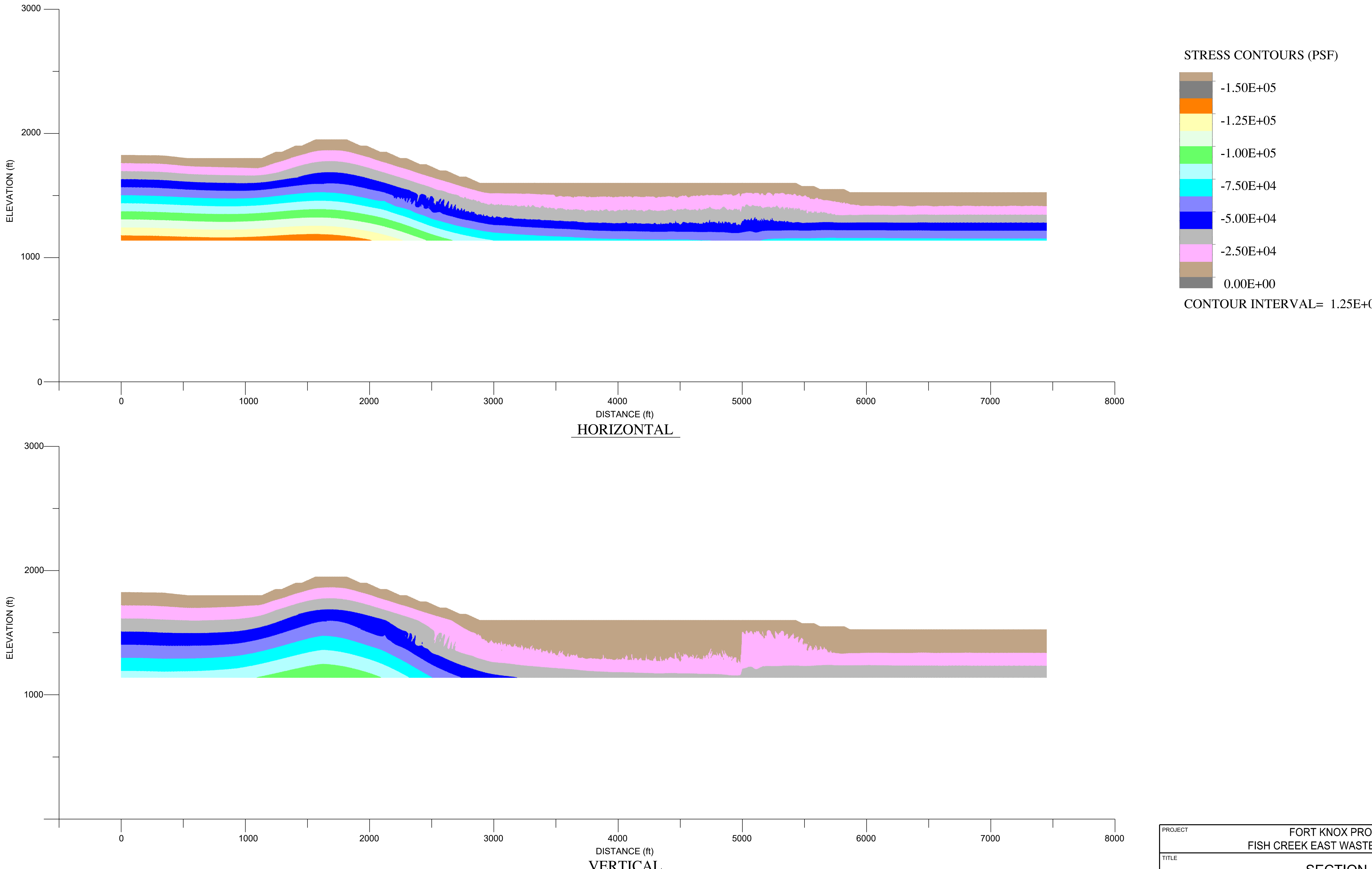

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION A INITIAL EFFECTIVE STRESS
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
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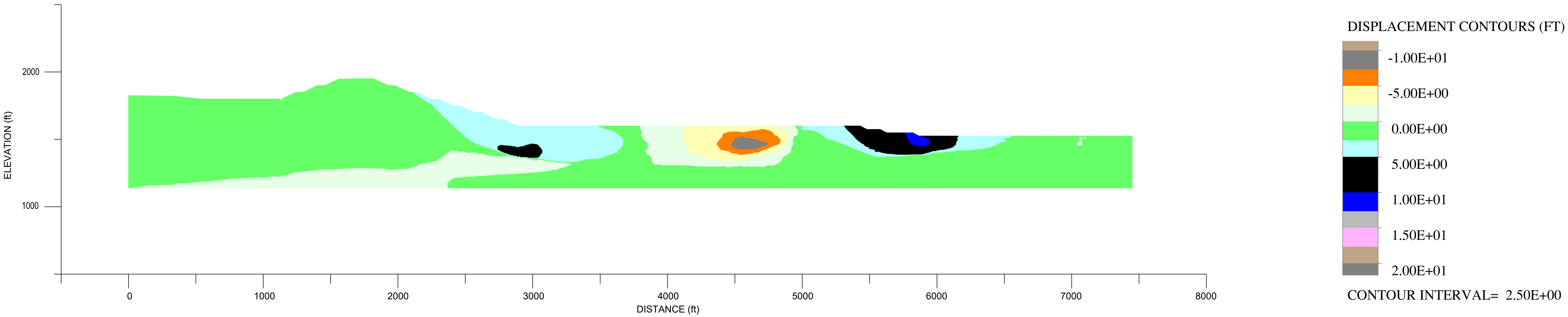
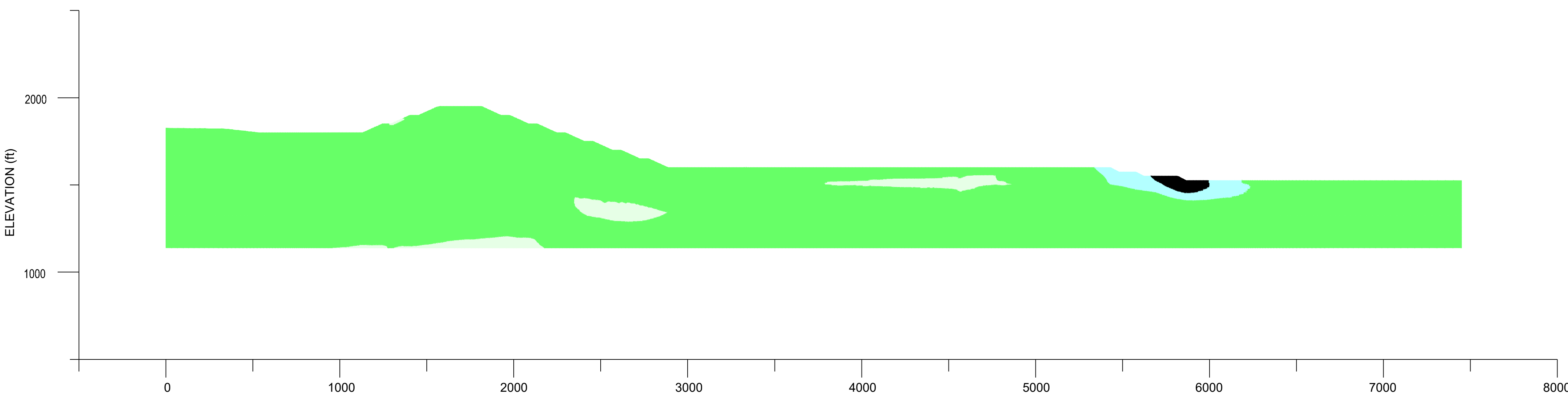
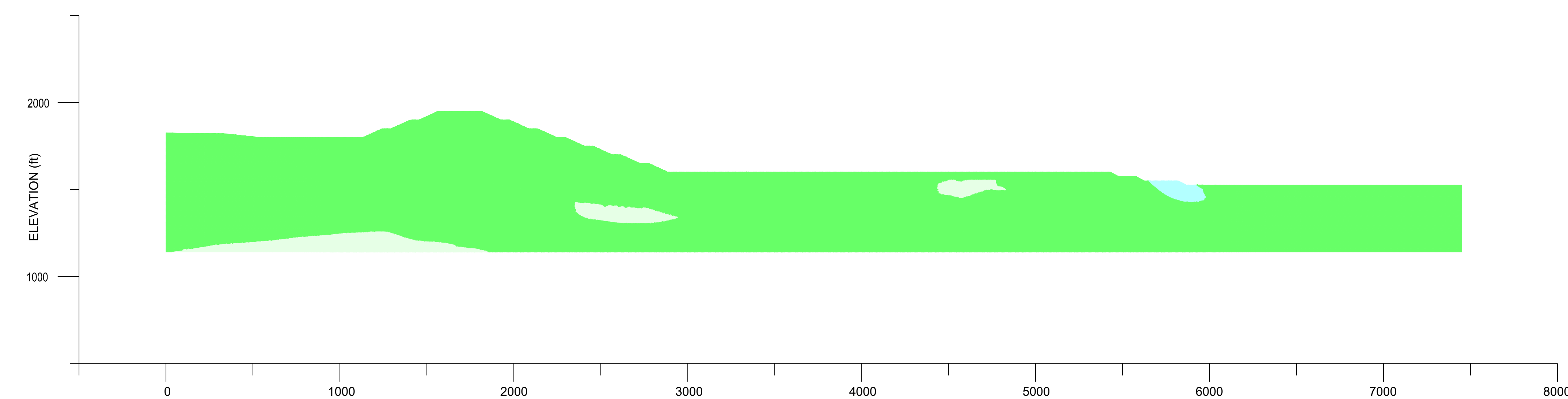


MCE 1



MCE 2



MCE 3

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION A HORIZONTAL DISPLACEMENTS AT END OF EARTHQUAKE LOADING
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	ET	DV101	00336.08	3.24	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
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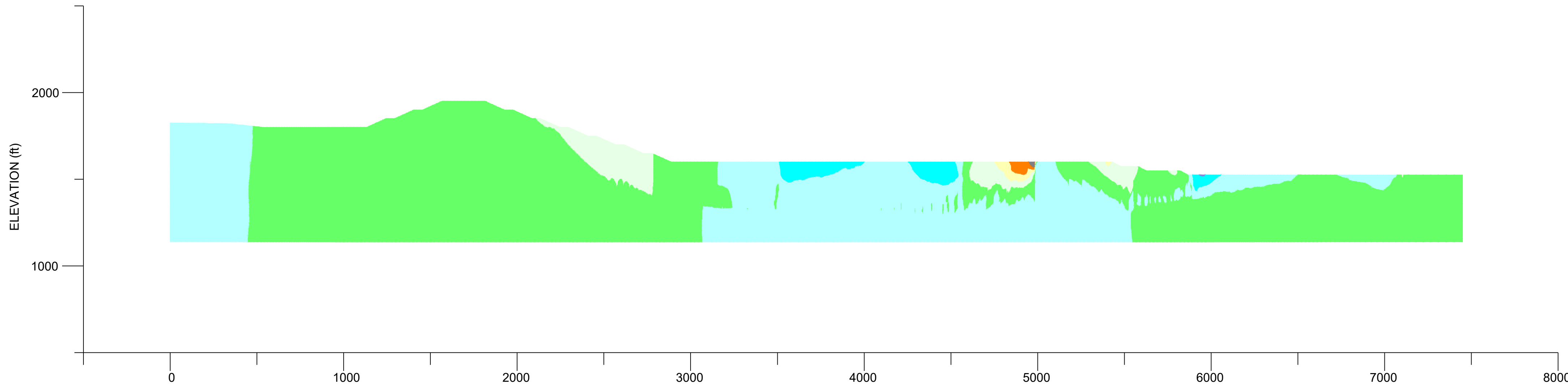

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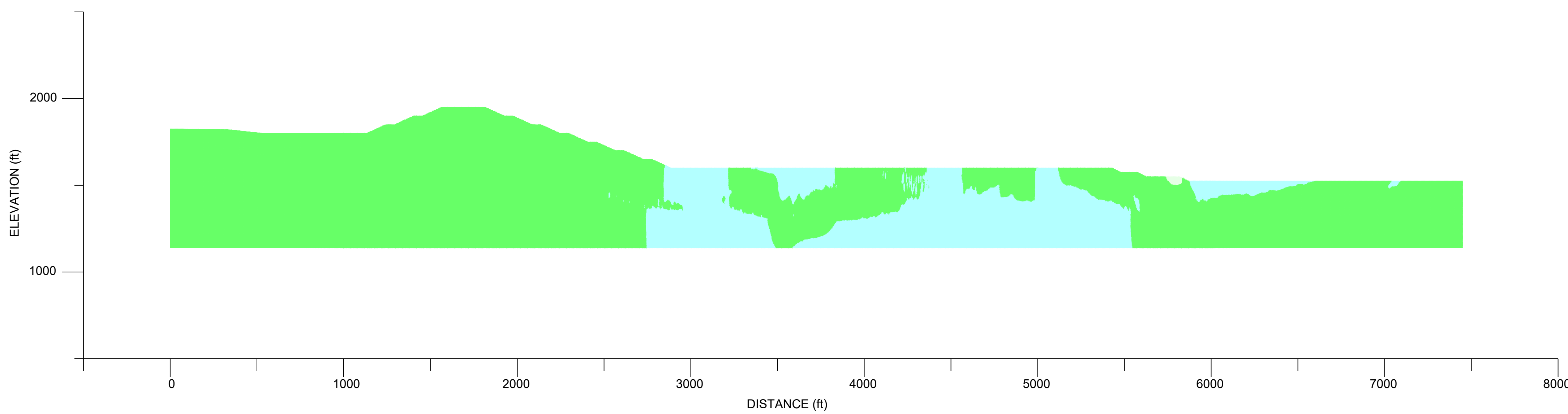

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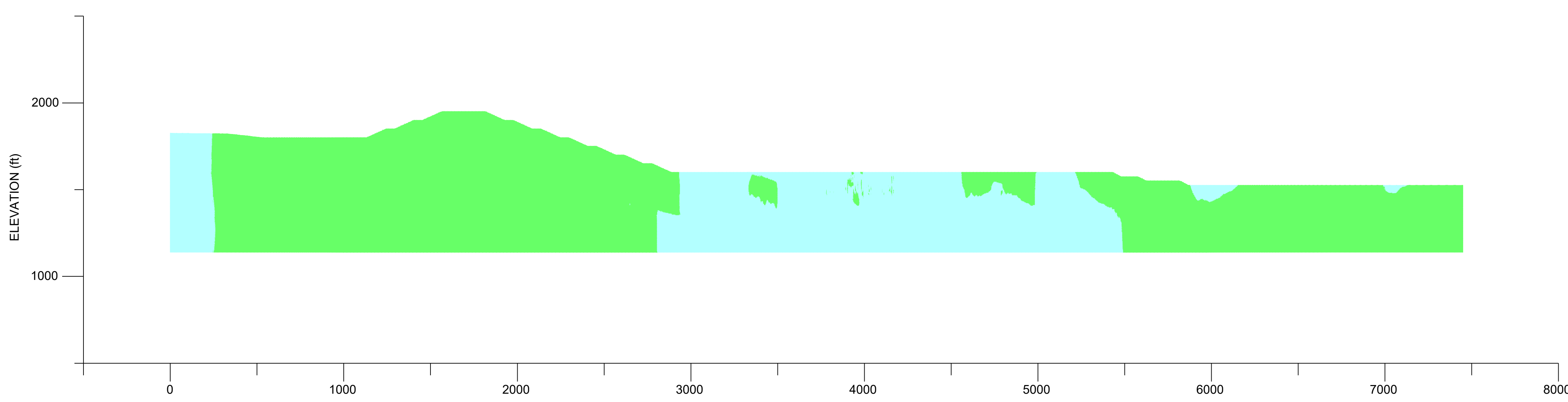

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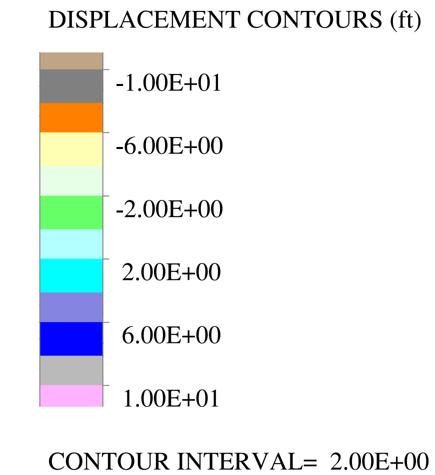

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP				
TITLE	SECTION A VERTICAL DISPLACEMENTS AT END OF EARTHQUAKE LOADING				
CLIENT	FAIRBANKS GOLD MINING, INC.				
Knight Piésold CONSULTING					
DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: ETRUJILLO
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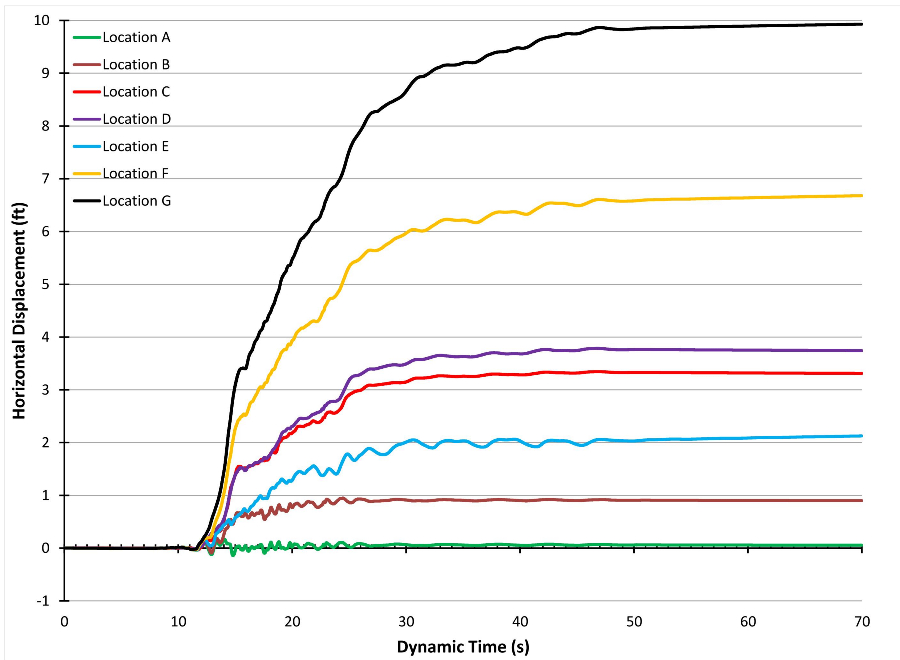

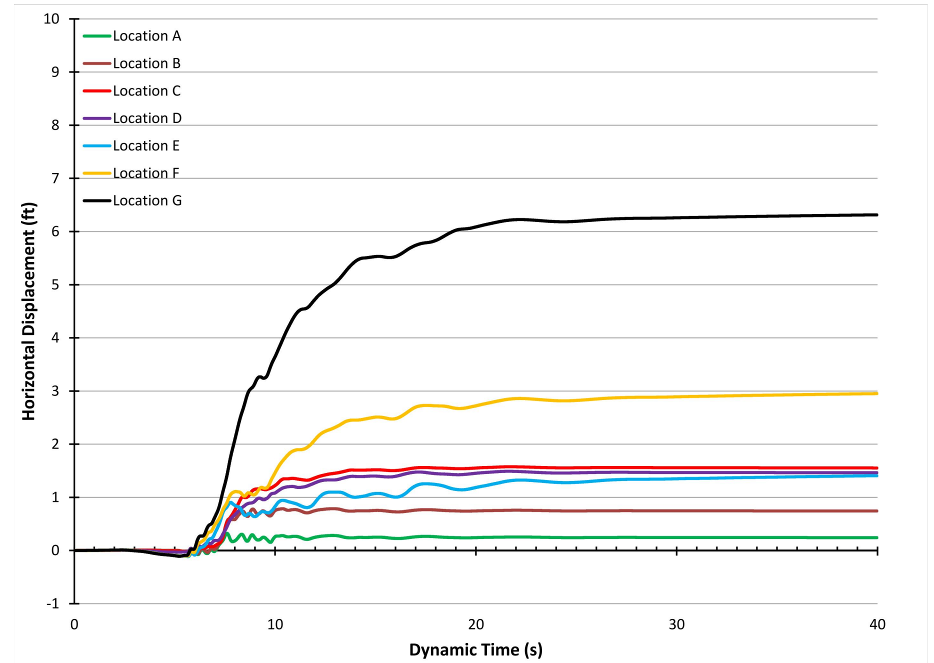

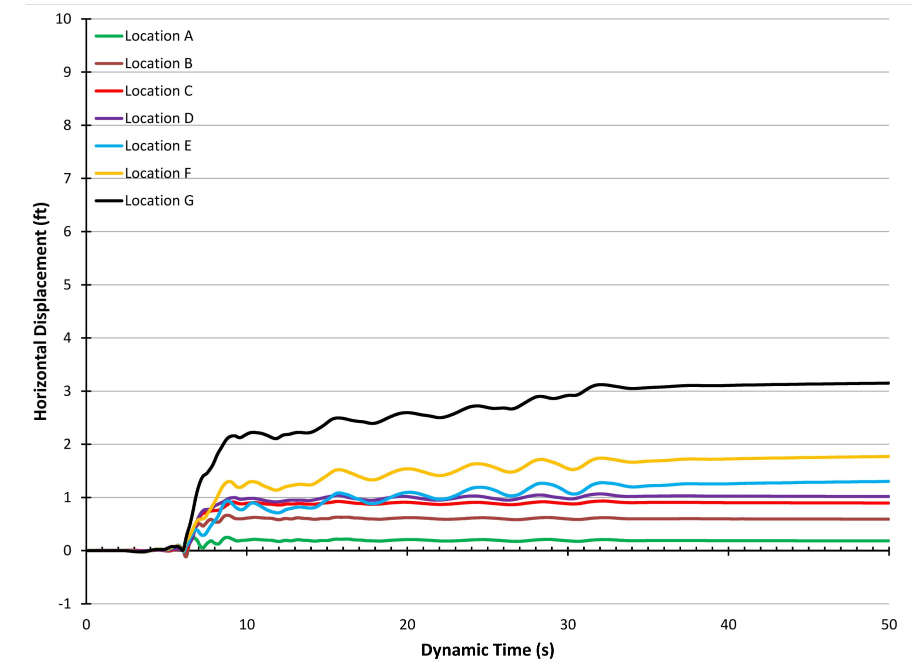

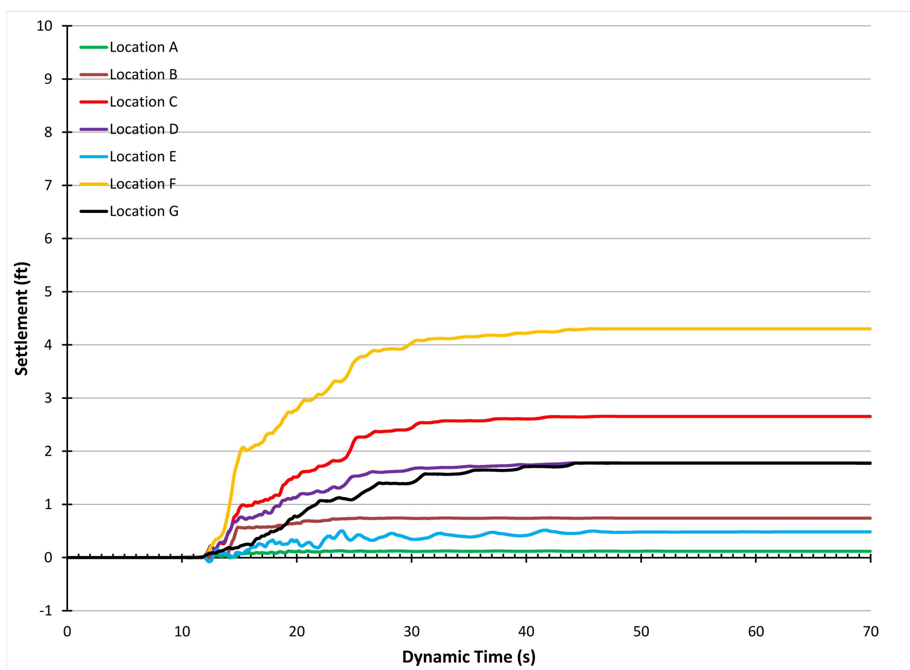

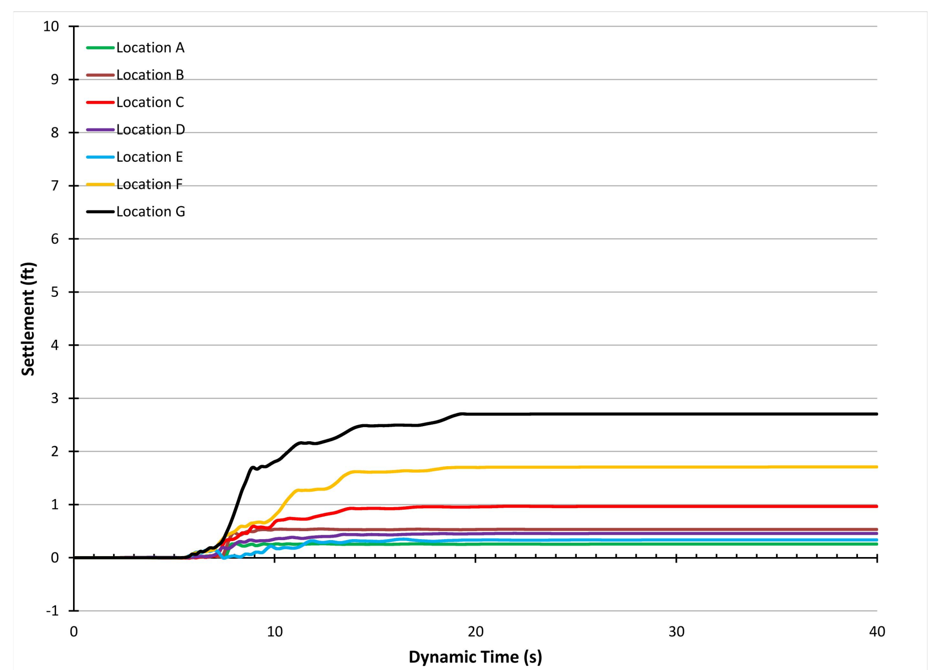

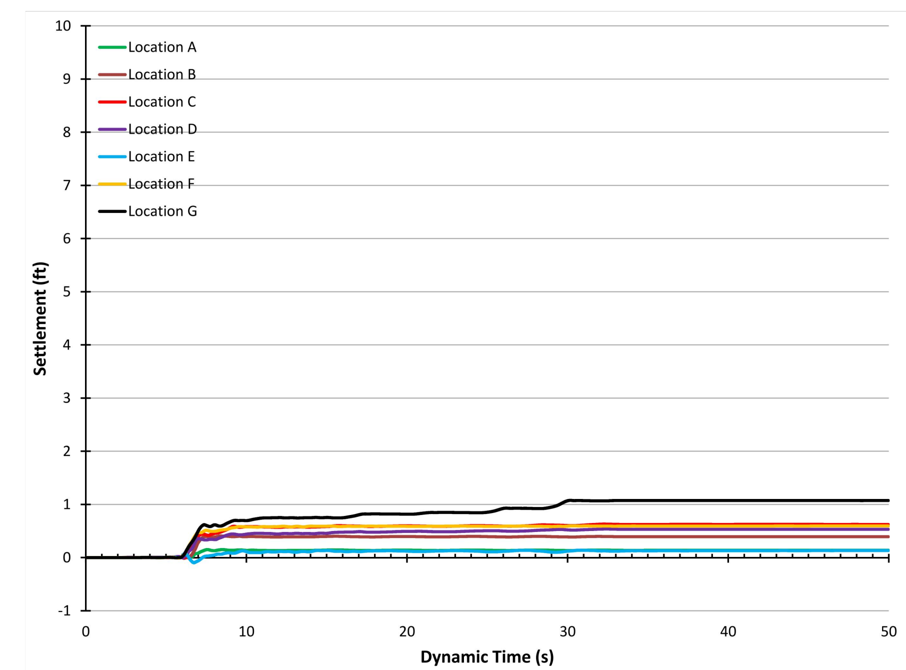

MCE 1

MCE 2

MCE 3

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION A DISPLACEMENT HISTORIES AT SELECTED LOCATIONS
CLIENT	FAIRBANKS GOLD MINING, INC.

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DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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LAST SAVED BY: RSAUER
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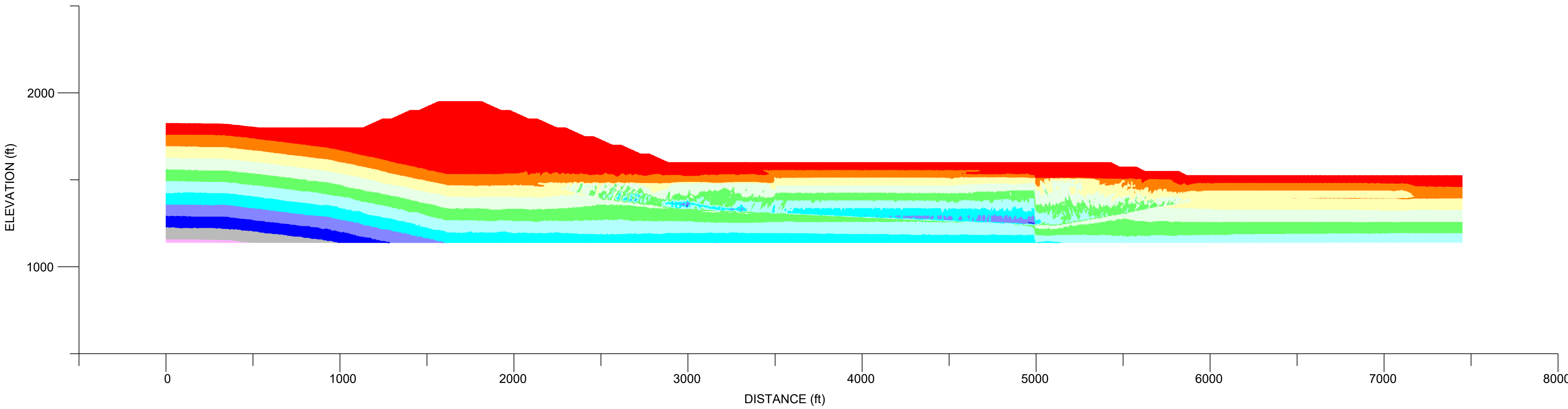

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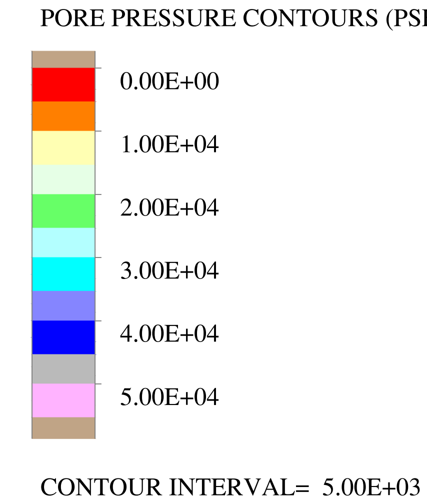

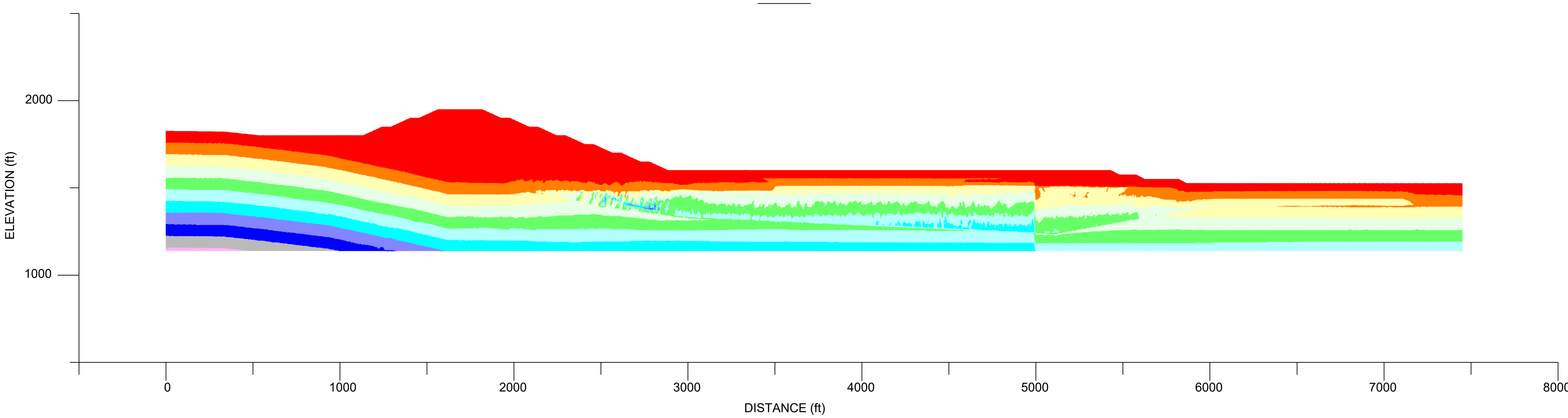

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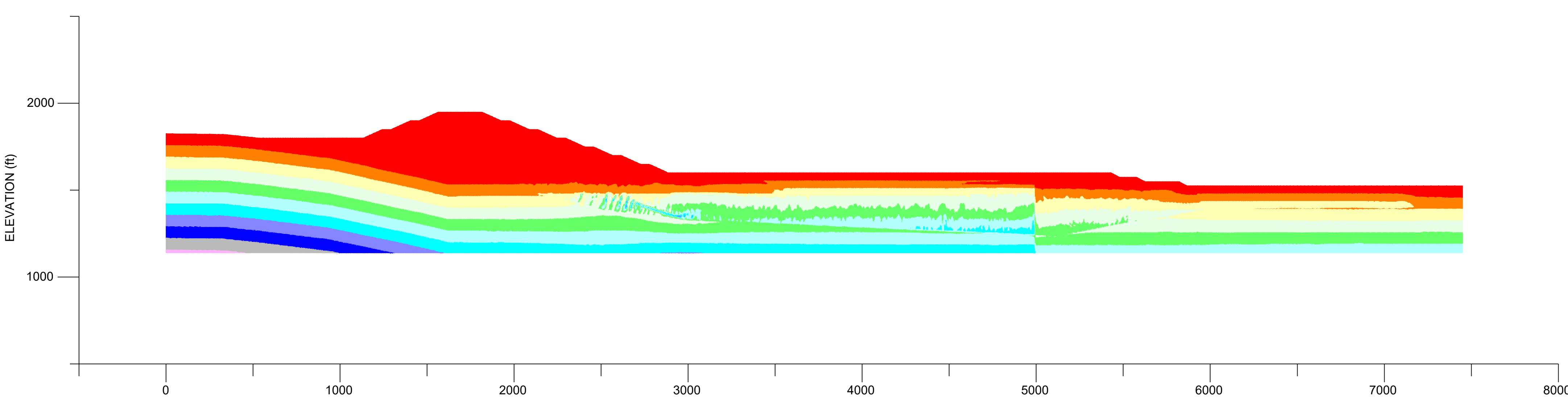

MCE 3

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION A PORE WATER PRESSURE AT END OF EARTHQUAKE LOADING
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
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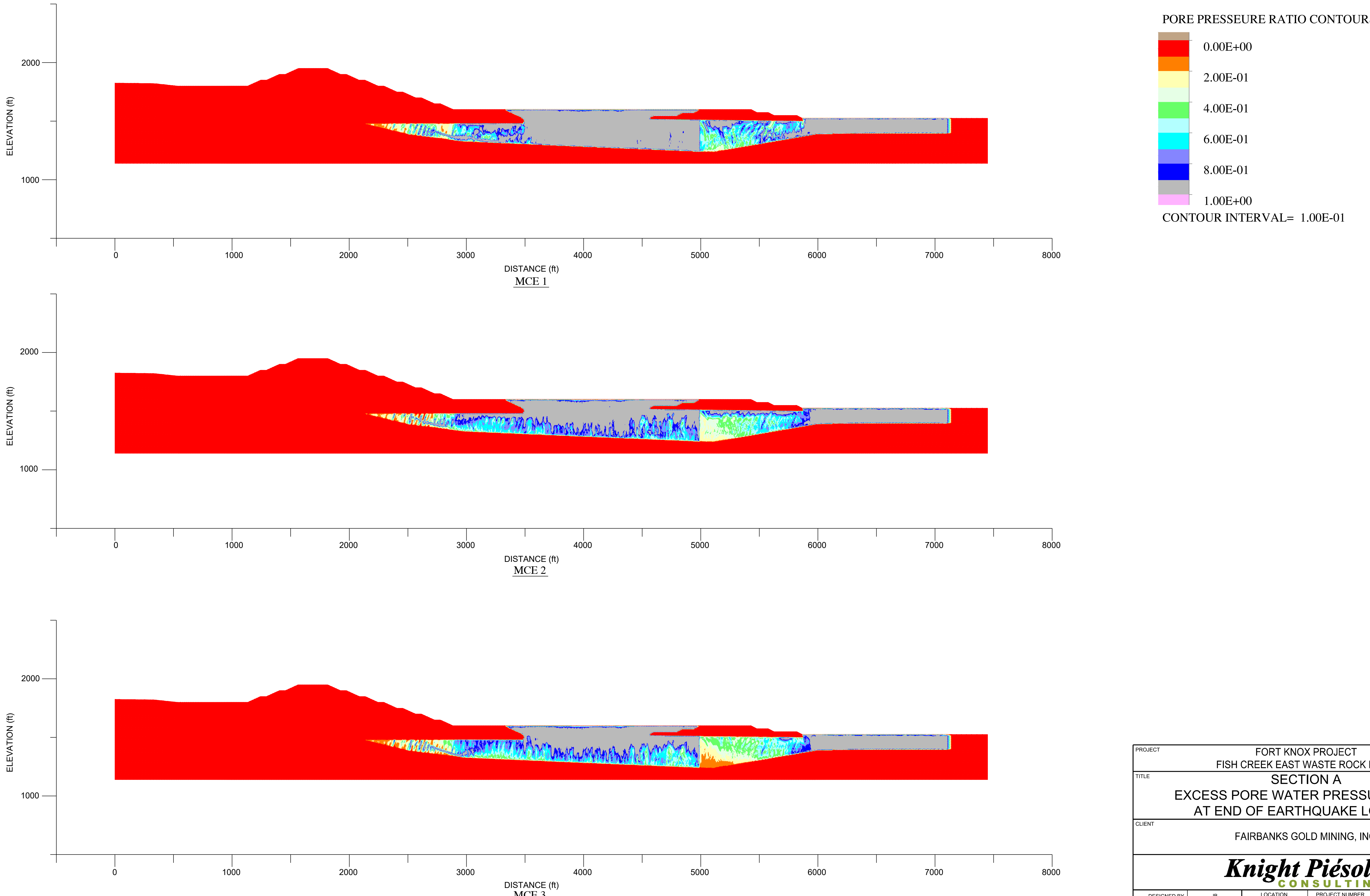

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION A EXCESS PORE WATER PRESSURE RATIO AT END OF EARTHQUAKE LOADING
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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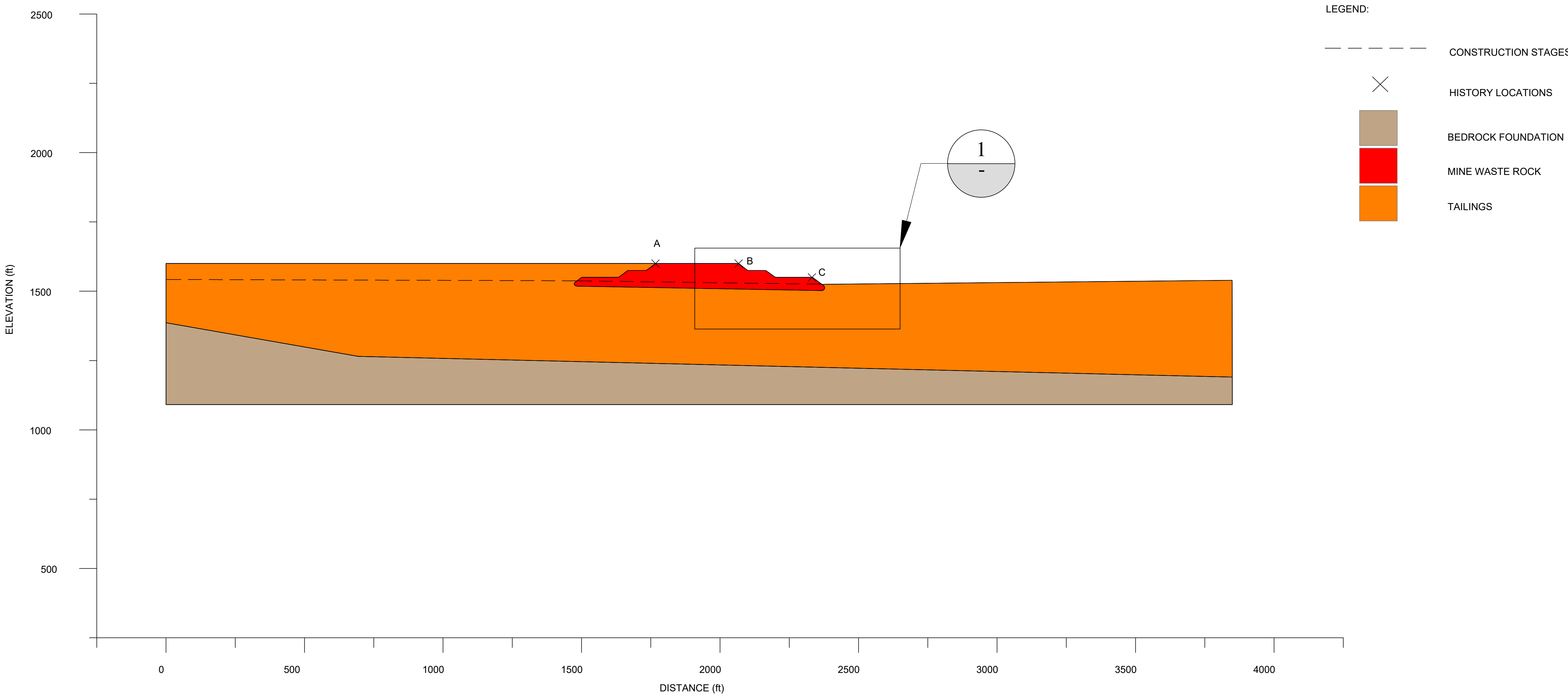

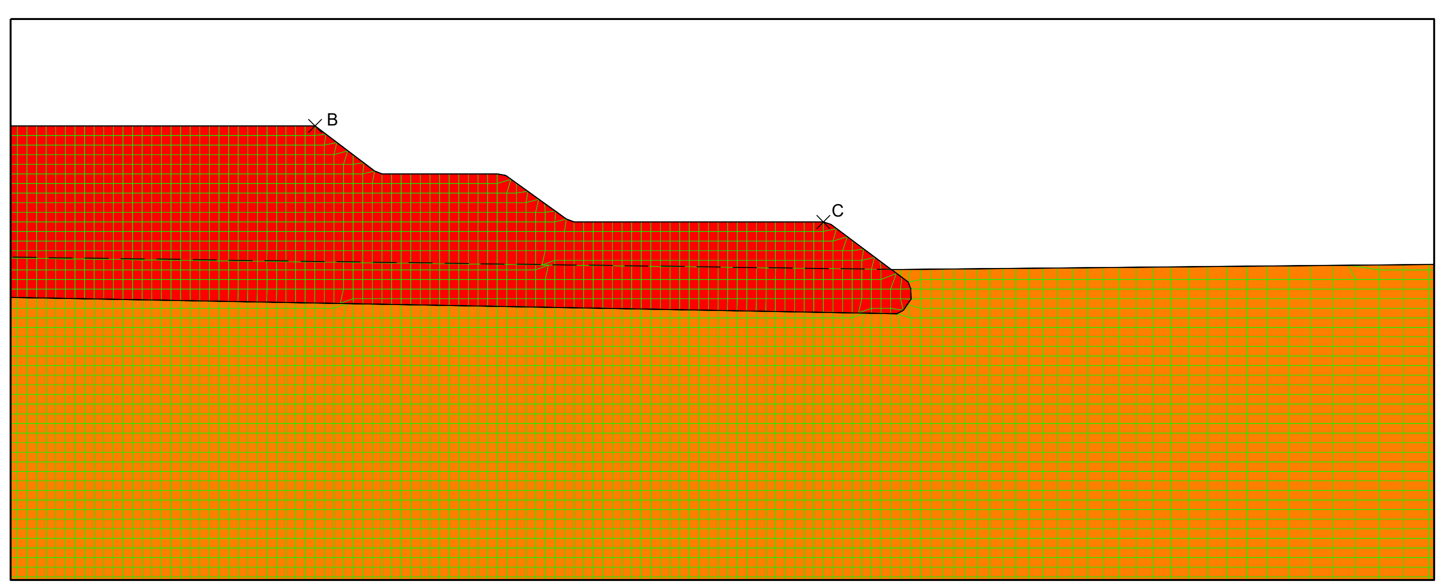

DETAIL 1

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION B FINITE DIFFERENCE MESH AND MATERIAL ZONES
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
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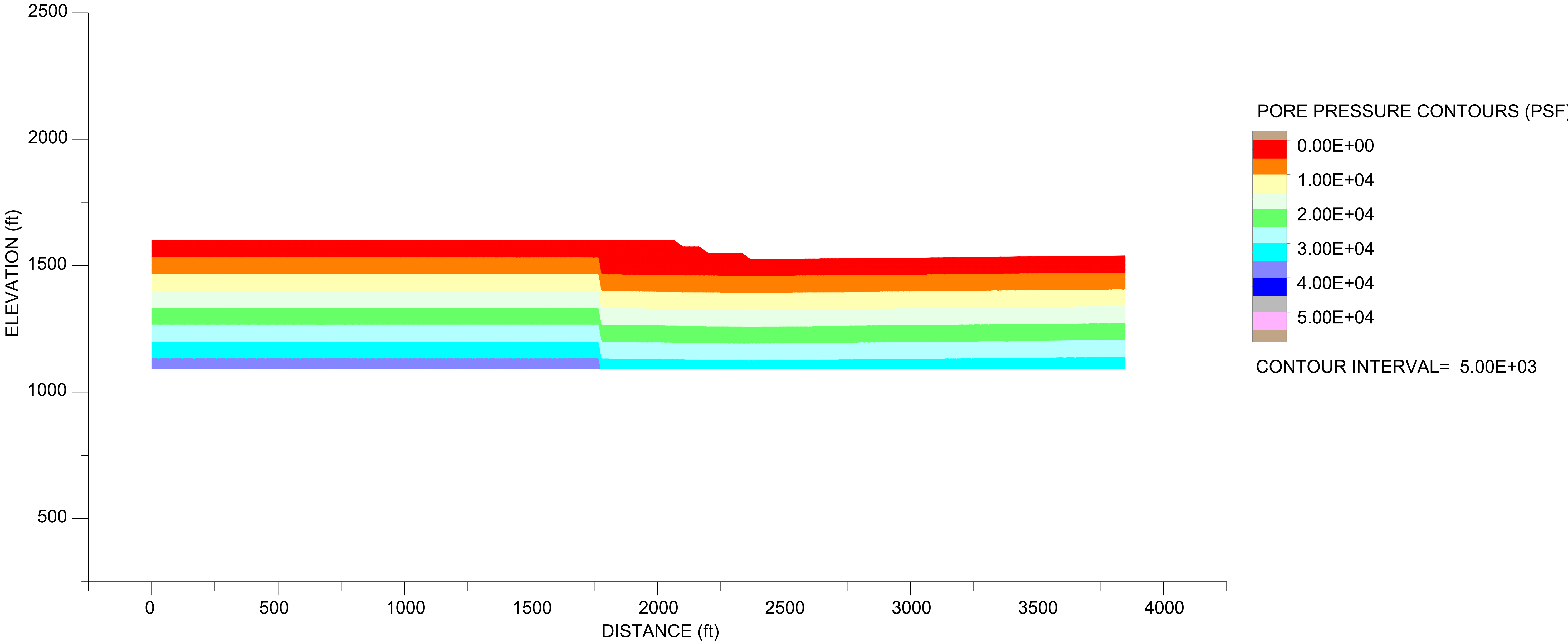

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION B INITIAL PORE WATER PRESSURE
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: ETRUJILLO
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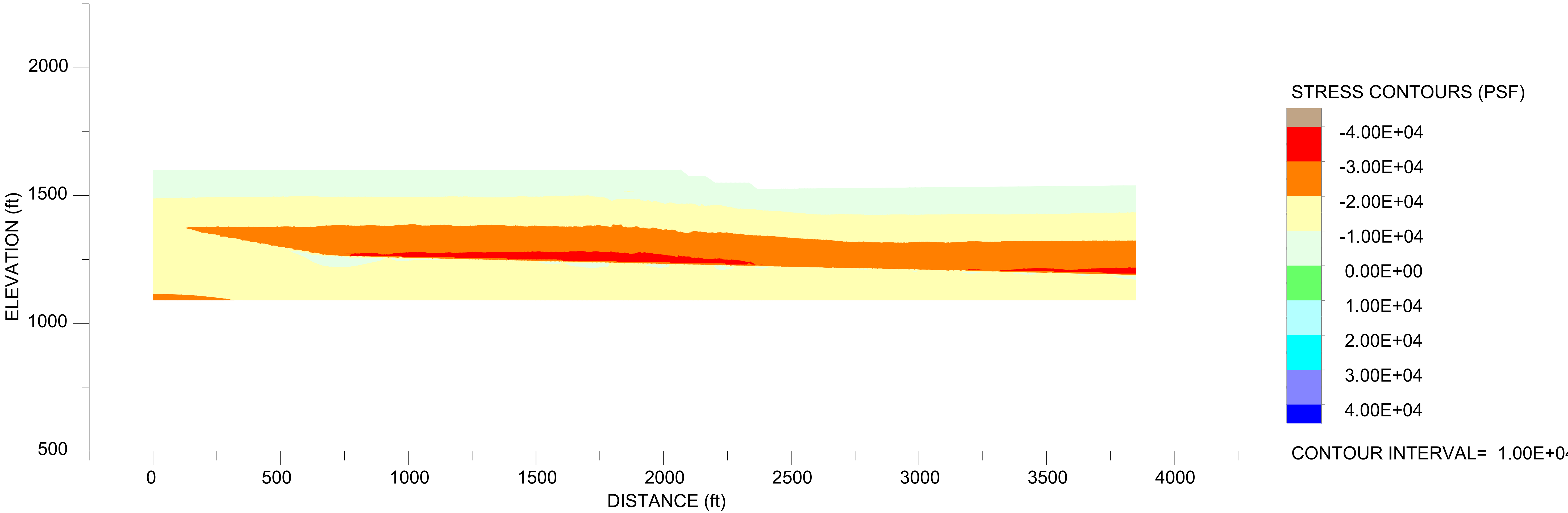

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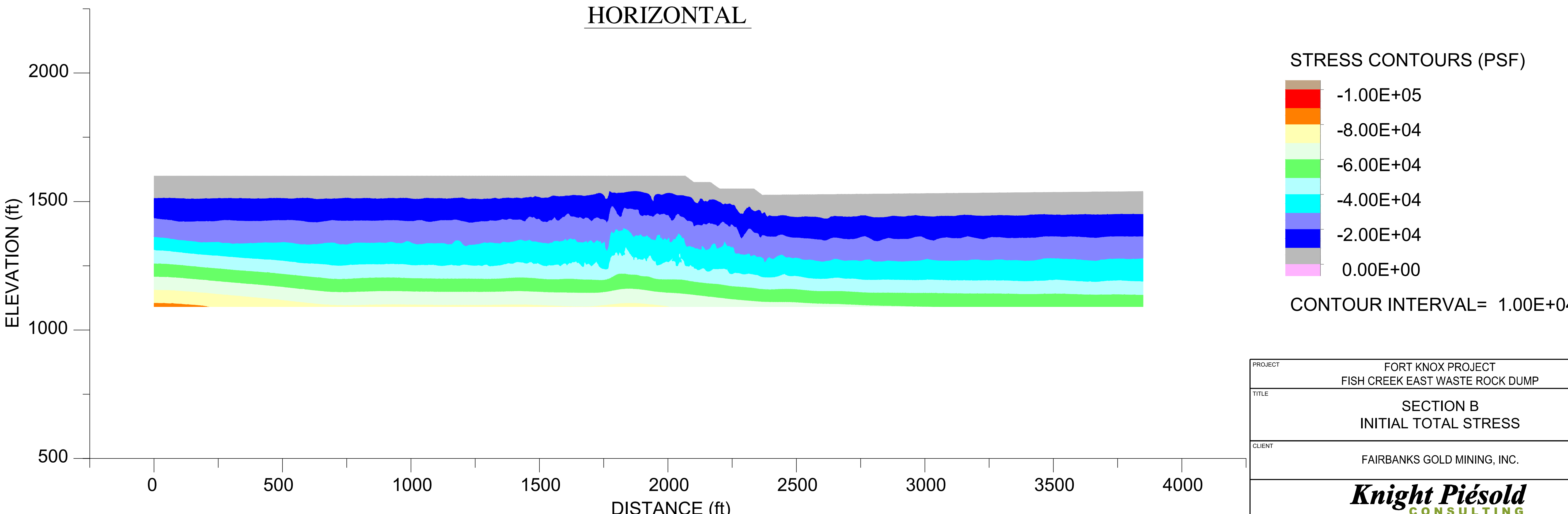

VERTICAL

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION B INITIAL TOTAL STRESS
CLIENT	FAIRBANKS GOLD MINING, INC.

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DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
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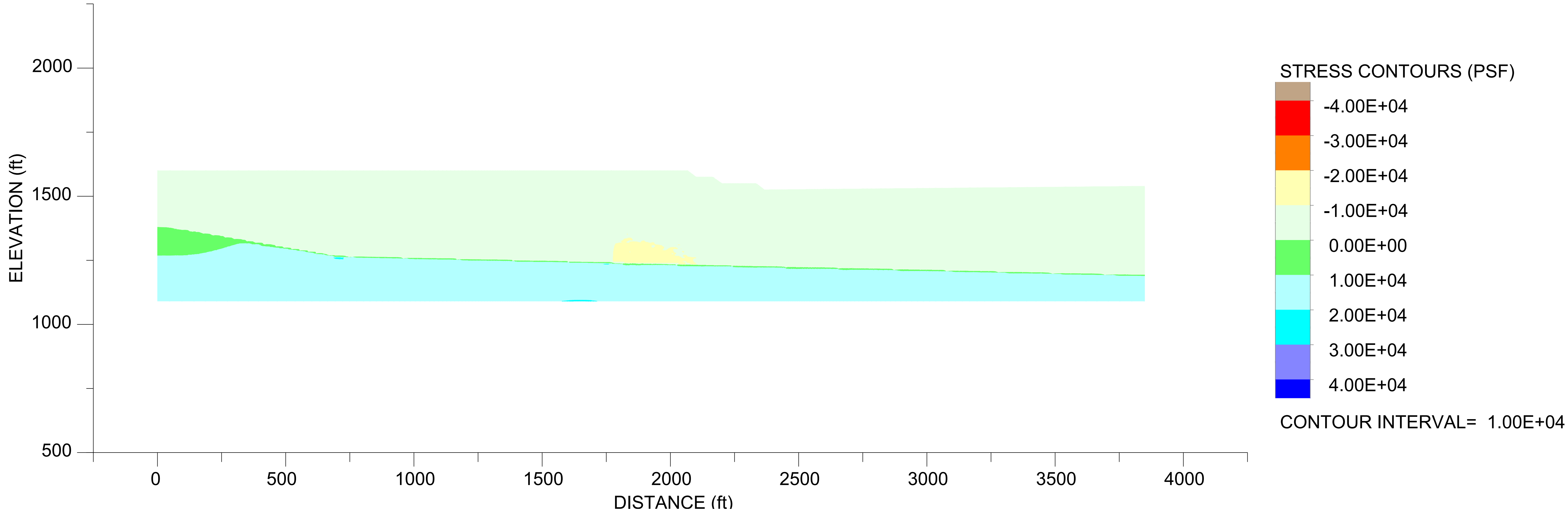

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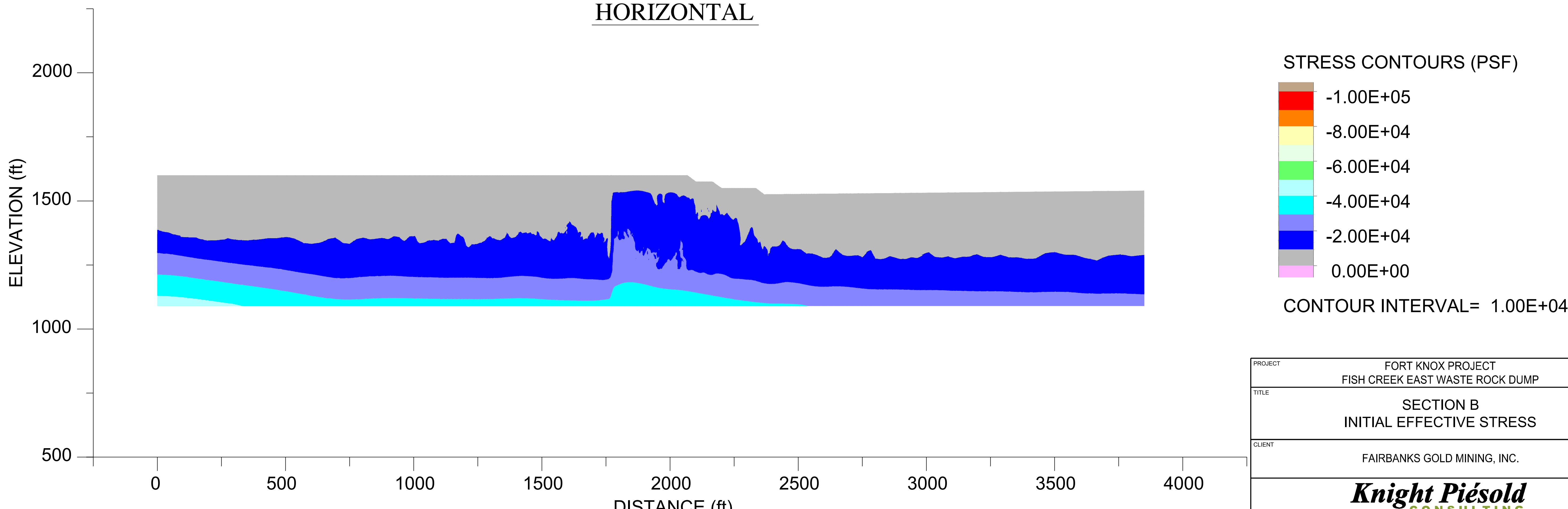

VERTICAL

PROJECT
FORT KNOX PROJECT
FISH CREEK EAST WASTE ROCK DUMP

TITLE
SECTION B
INITIAL EFFECTIVE STRESS

CLIENT
FAIRBANKS GOLD MINING, INC.

Knight Piésold
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DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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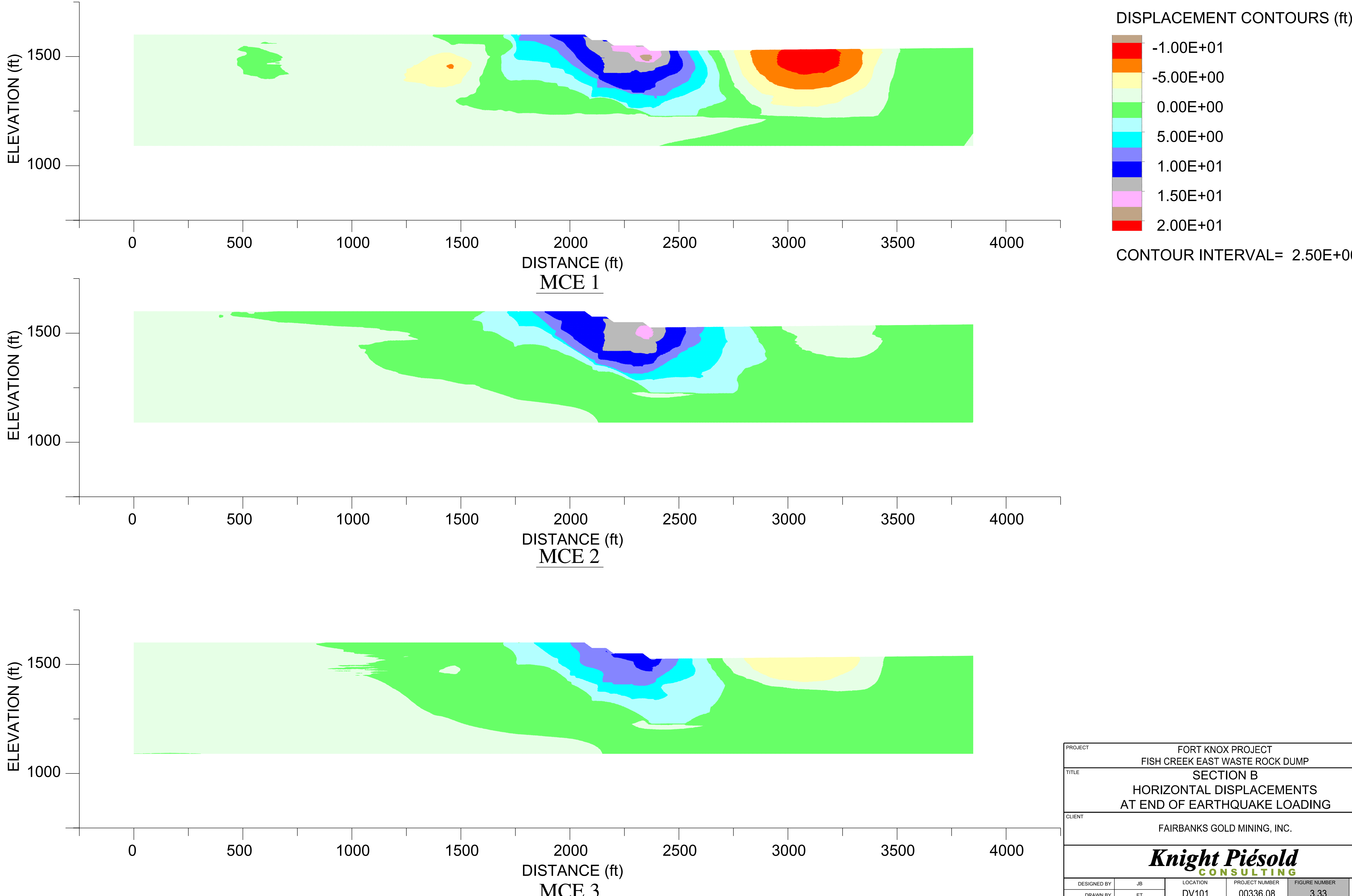

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TITLE	SECTION B HORIZONTAL DISPLACEMENTS AT END OF EARTHQUAKE LOADING				
CLIENT	FAIRBANKS GOLD MINING, INC.				
	Knight Piésold CONSULTING				
DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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LAST SAVED BY: RSAUER
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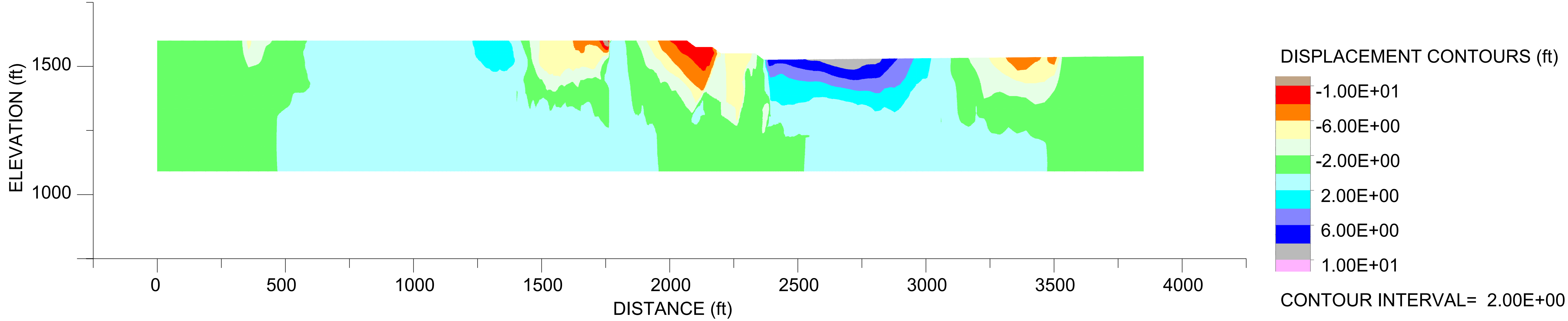

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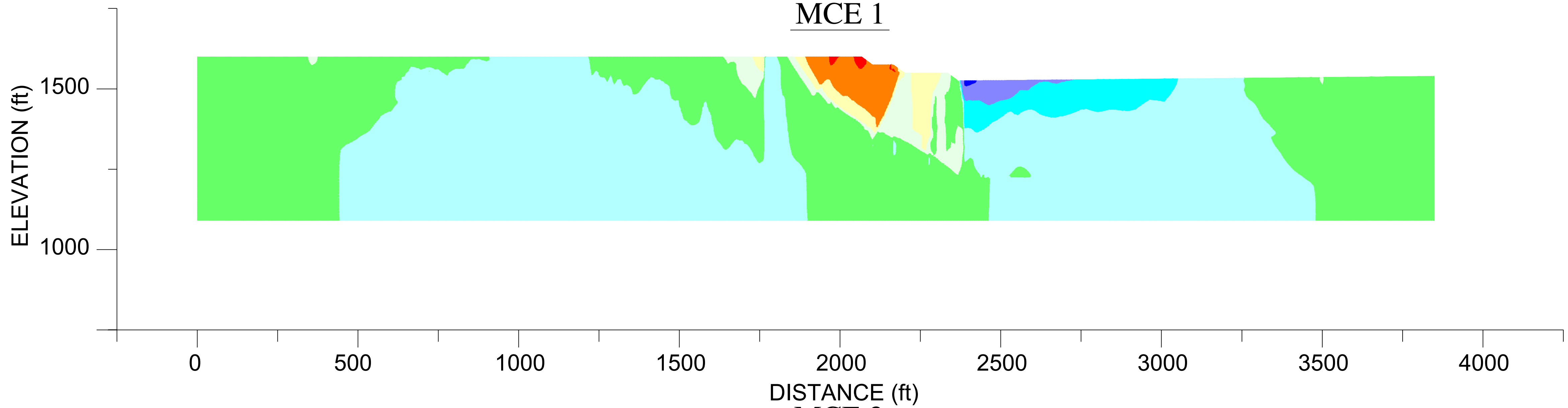
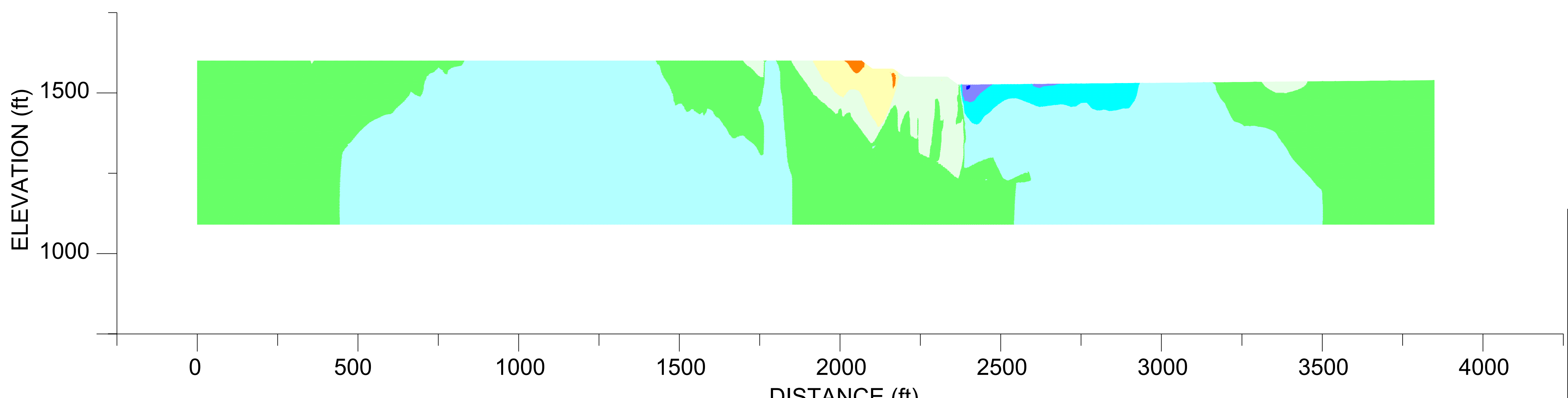


MCE 2



MCE 3

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION B VERTICAL DISPLACEMENTS AT END OF EARTHQUAKE LOADING
CLIENT	FAIRBANKS GOLD MINING, INC.

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DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	ET	DV101	00336.08	3.34	0
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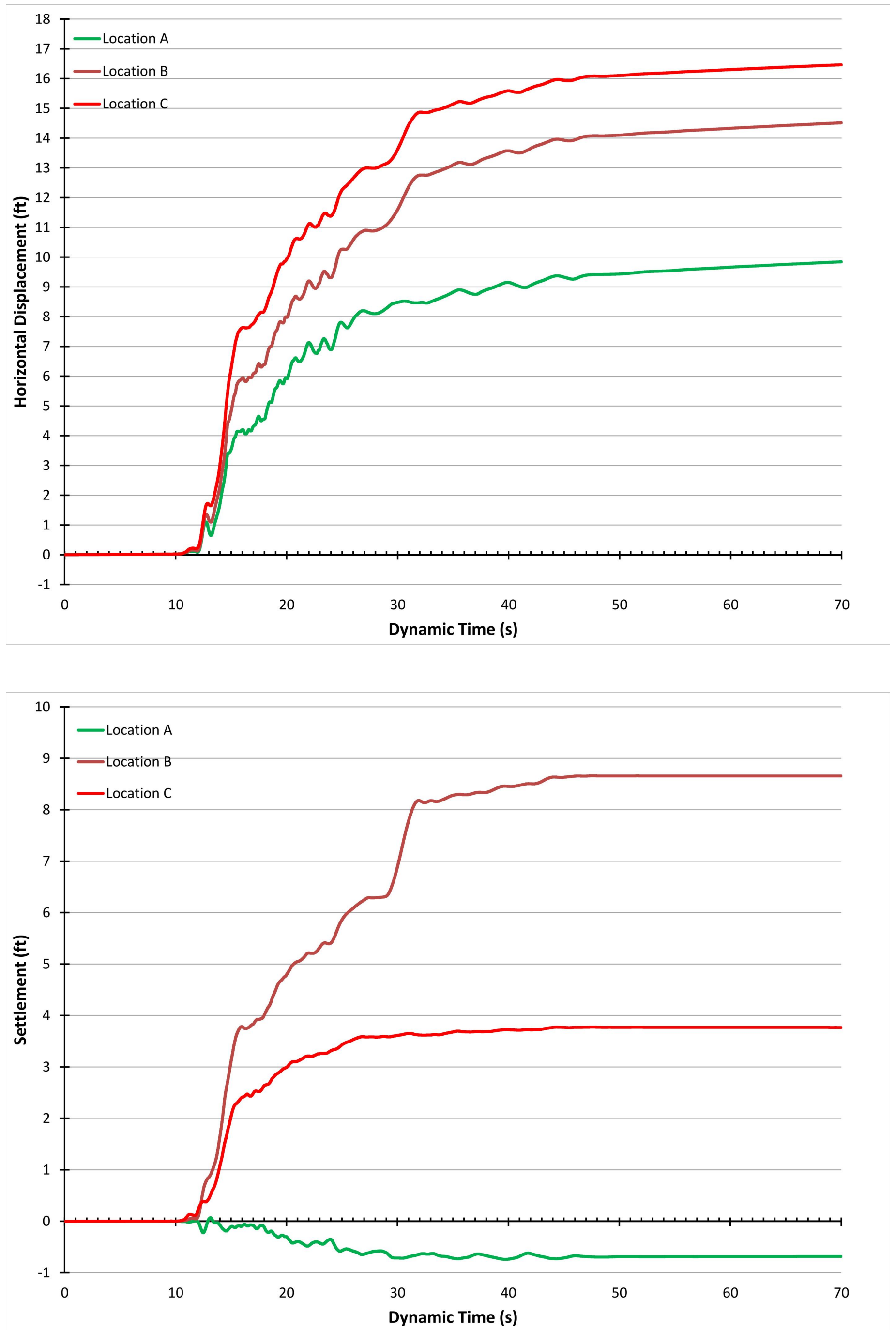
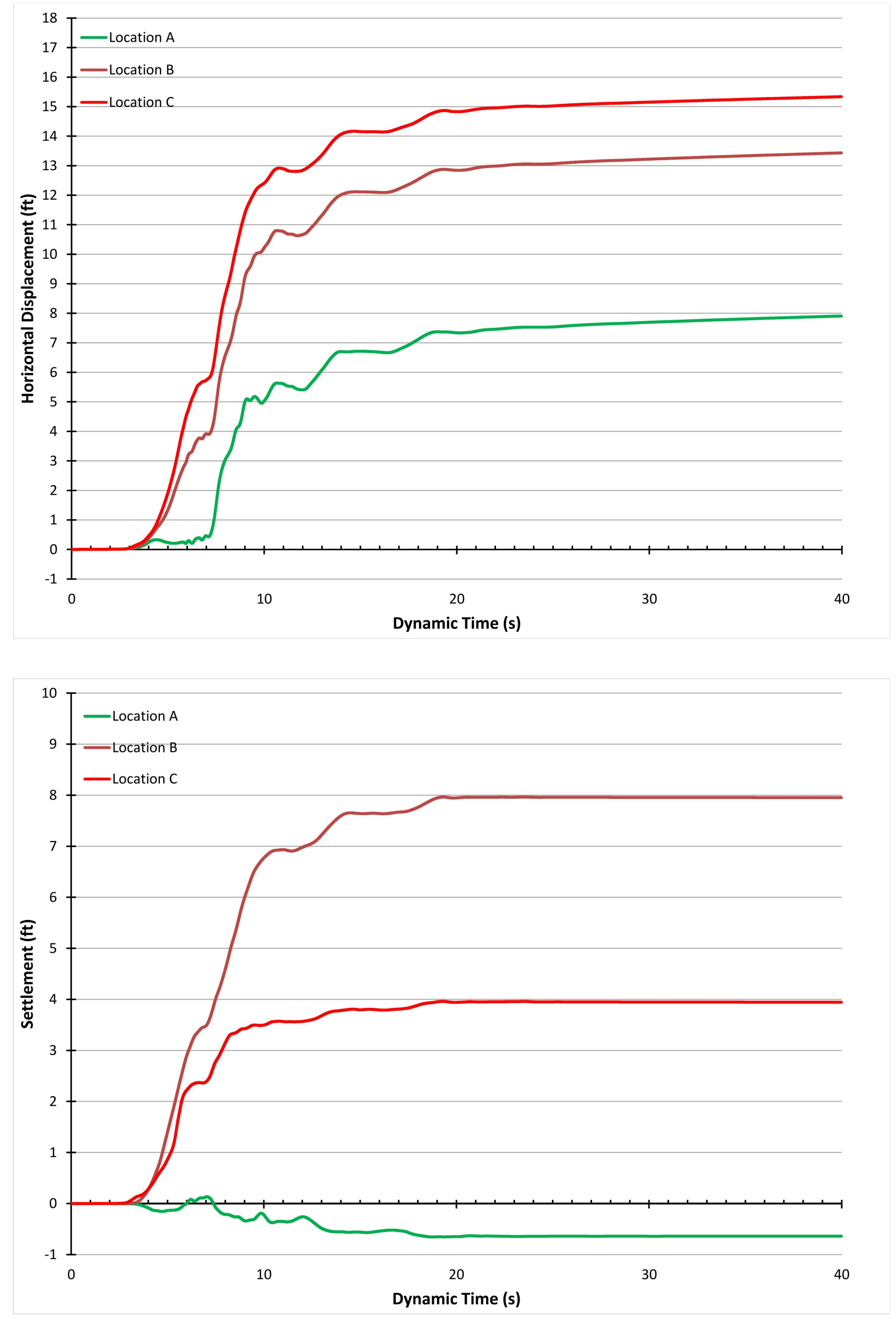
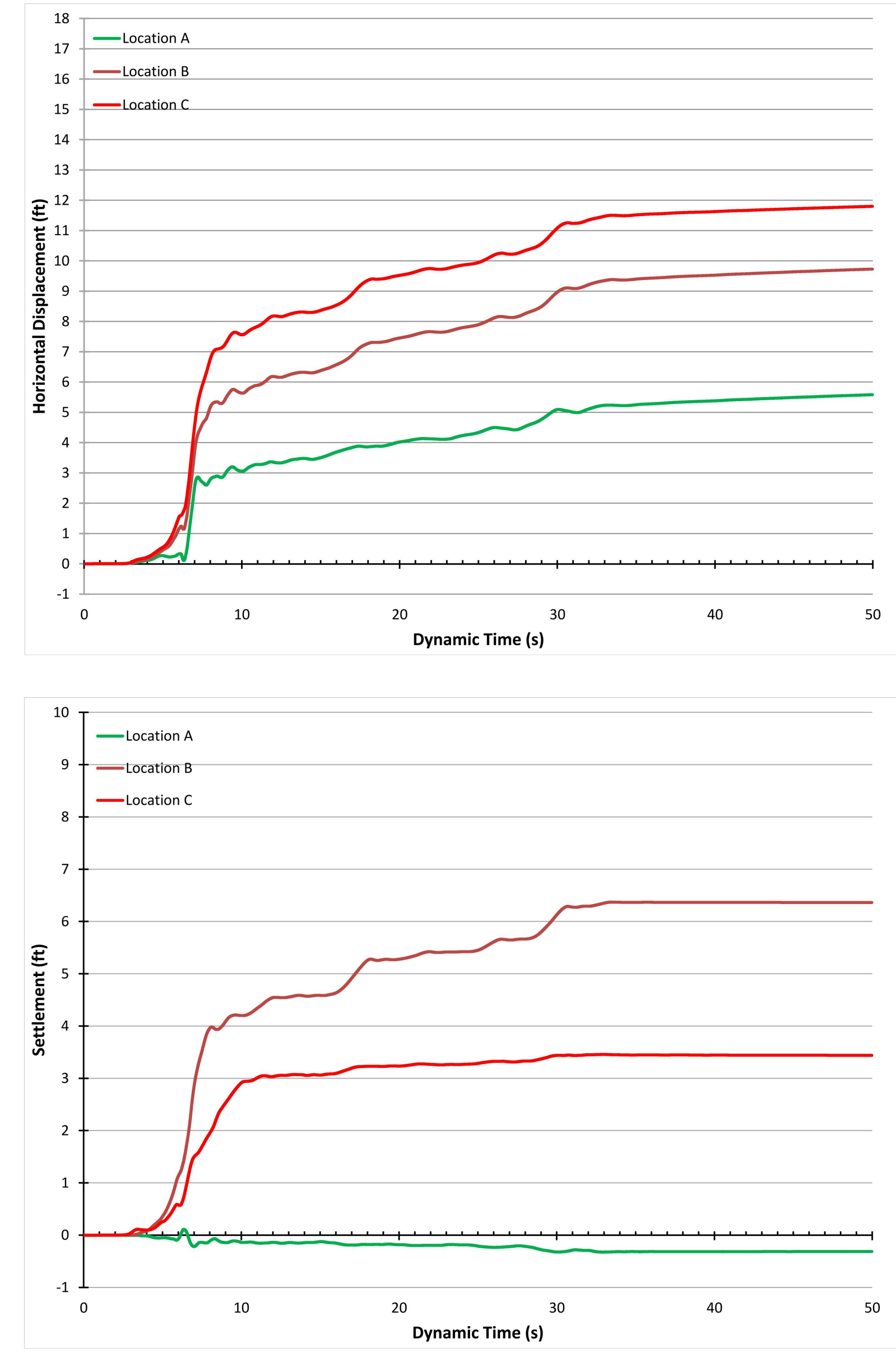


MCE 1



MCE 2



MCE 3

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION B DISPLACEMENT HISTORIES AT SELECTED LOCATIONS
CLIENT	FAIRBANKS GOLD MINING, INC.

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DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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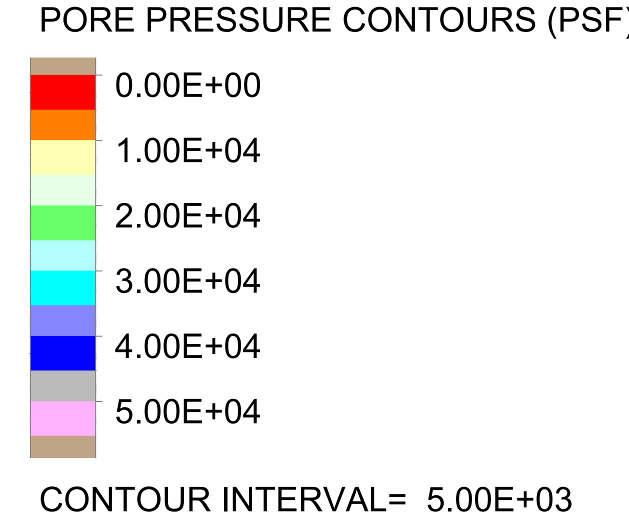
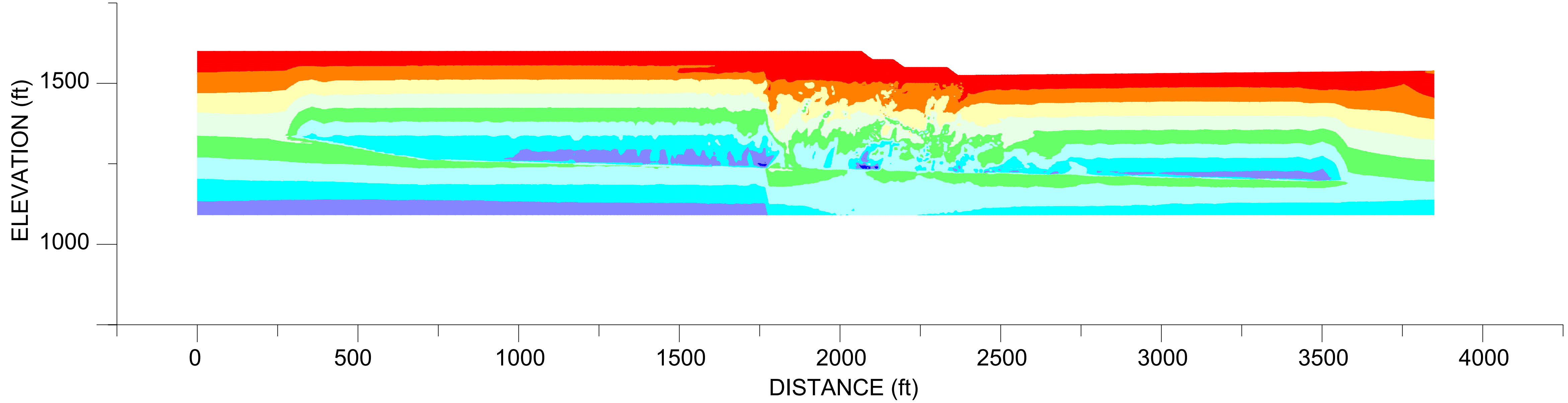
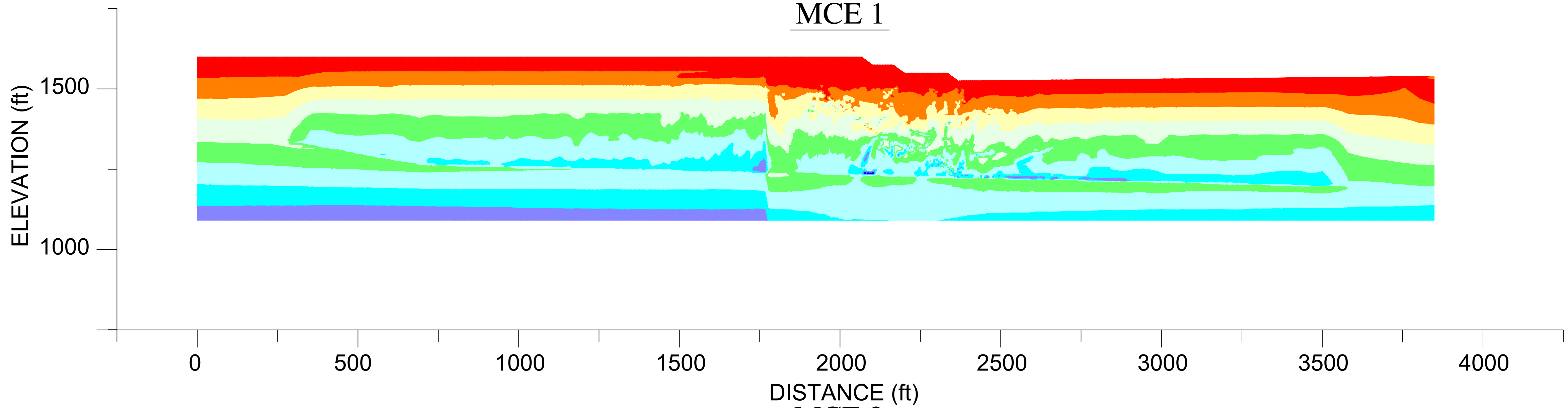
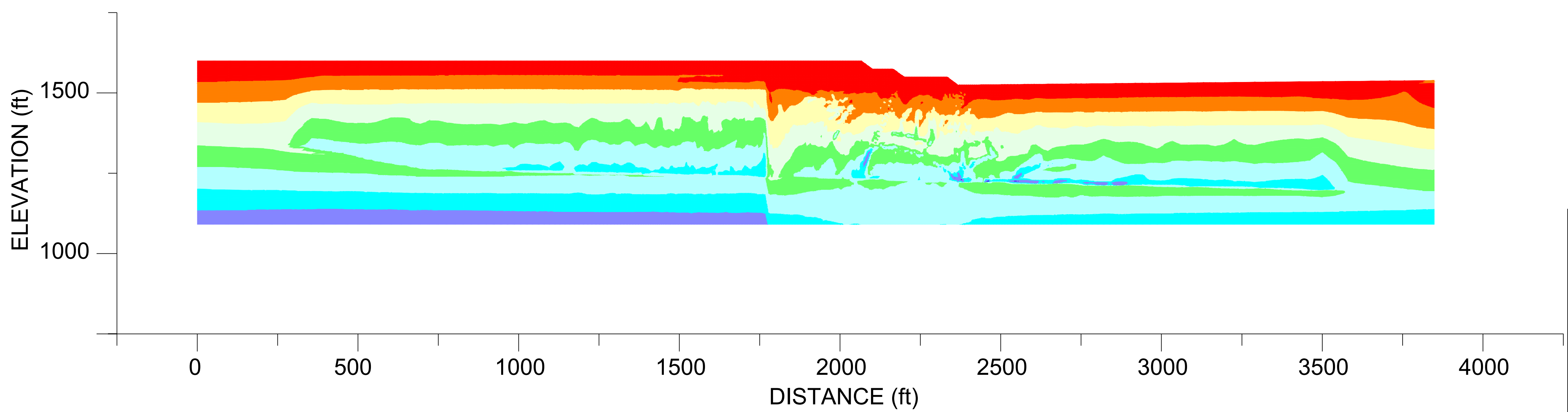




MCE 1



MCE 2



MCE 3

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION B PORE WATER PRESSURE AT END OF EARTHQUAKE LOADING
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold
CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
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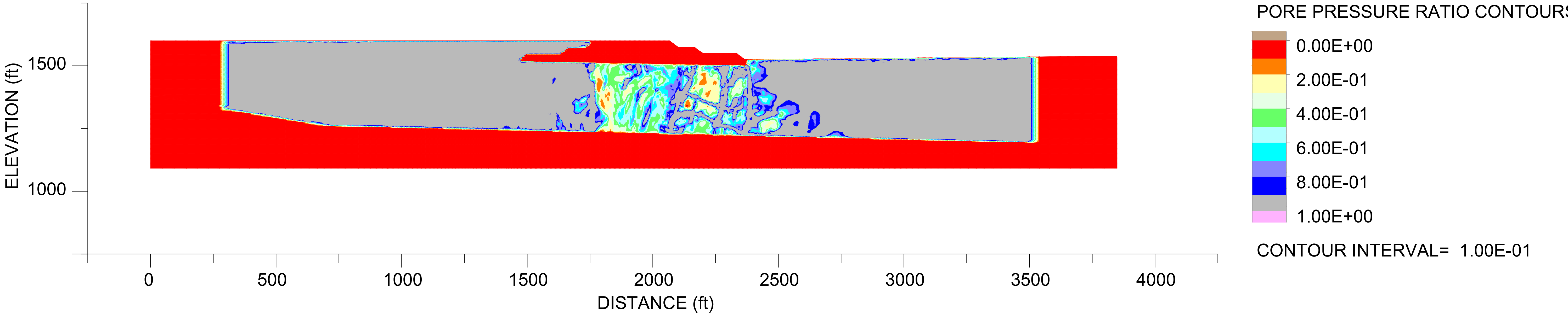
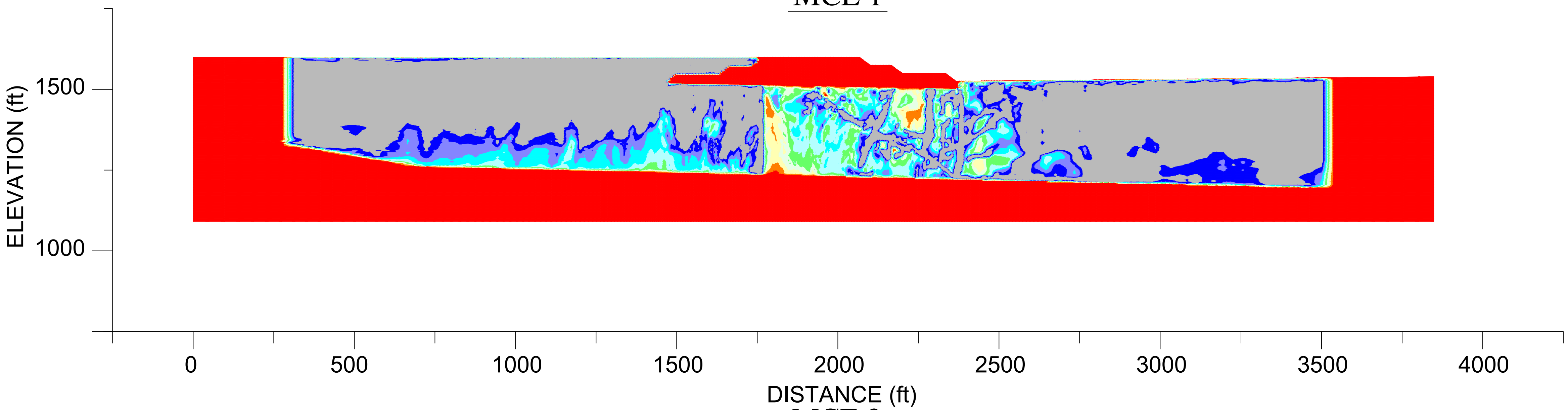
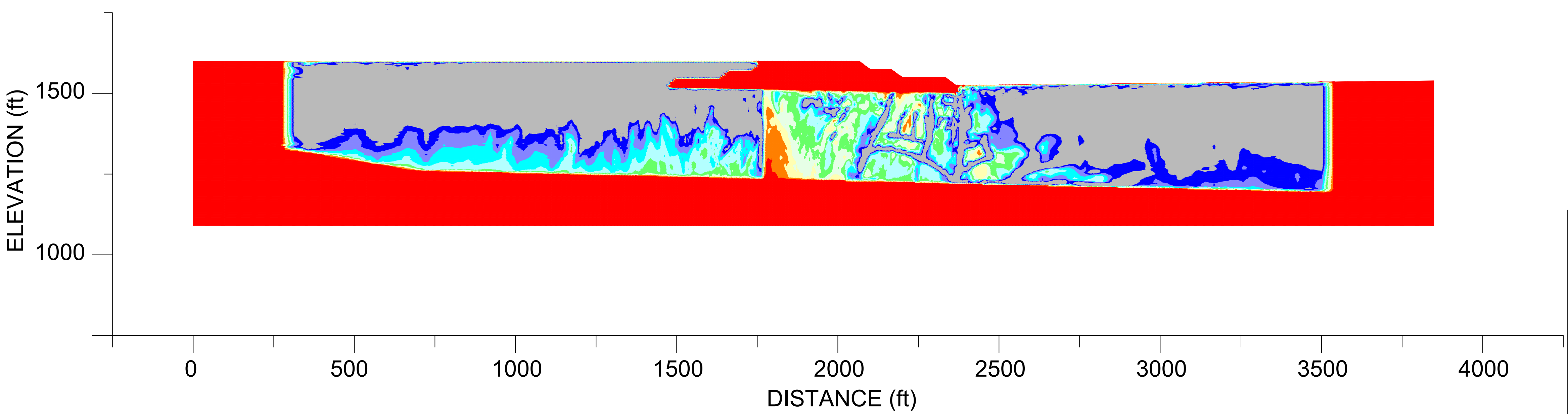


MCE 1



MCE 2



MCE 3

PROJECT	FORT KNOX PROJECT FISH CREEK EAST WASTE ROCK DUMP
TITLE	SECTION B EXCESS PORE WATER PRESSURE RATIO AT END OF EARTHQUAKE LOADING
CLIENT	FAIRBANKS GOLD MINING, INC.

Knight Piésold CONSULTING

DESIGNED BY	JB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
DRAWN BY	ET	DV101	00336.08	3.37	0
ACTIVITY CODE	N/A	XREF NUMBER	N/A		

LAST SAVED BY: RSAUER
DRAWING PATH: G:\101\00336.08\CAD\CAD Dept\Figures\AnalysisReport\FIG3.38.dwg
PRINTED BY: CHAD BEANLAND, PRINT TIME: 8/8/2017 5:29 PM

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Appendix A

Seismic Hazard Assessment

Knight Piésold
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MEMORANDUM

To:	Peter D. Duryea	Date:	March 9, 2009
Copy To:	Tom Kerr	File No.:	DV101-89/19-A.01
From:	Graham Greenaway	Cont. No.:	VA09-00309
Re:	Fort Knox Mine – Determination of the Maximum Credible Earthquake and selection of earthquake time-history records for tailings facility seismic analyses		

1.0 INTRODUCTION

An assessment of the regional seismicity has been carried out and analyses completed to determine an appropriate Maximum Credible Earthquake for consideration in seismic design studies for the tailings facility.

Earthquake time history records have been identified for use as input motions for seismic response and deformation analyses conducted for the tailings facility. Suitable earthquake acceleration records are provided for the Maximum Design Earthquake (MDE) and Maximum Credible Earthquake (MCE) events.

Seismic ground motion parameters (maximum acceleration and earthquake magnitude) and design earthquake characteristics (epicentral distance and depth) have been determined from probabilistic and deterministic seismic hazard analyses and consideration of the regional seismicity.

2.0 REGIONAL SEISMICITY

The historical seismic record indicates that the region of interior Alaska has experienced numerous moderate earthquakes and occasional large magnitude (M7+) earthquakes over the last century. The seismicity is the result of interaction between the Pacific and North American tectonic plates along the coastal region of southern Alaska. Evidence shows that these tectonic plates are locking as they pass each other, building up tremendous pressure that can sometimes be released as large Magnitude 8 to 9+ earthquakes. These large interface subduction (thrust) earthquakes typically occur at shallow depths of 10 to 25 miles. This seismic source region, known as the Alaska-Aleutian Megathrust, has been responsible for several of the largest earthquakes recorded globally, including the 1964 Prince William Sound Magnitude 9.2 (M9.2) earthquake.

North-westward movement of the subducting Pacific plate produces stresses within the overlying North American plate that are transmitted into the interior of Alaska. These stresses, and resulting crustal deformations, are accommodated by a series of arcuate, right-lateral shear systems, including the Denali fault system, located approximately 100 miles south of the Ft. Knox project, and the Kaltag-Tintina fault system, approximately 60 miles to the north. These fault systems are active and capable of generating large earthquakes. The November 3, 2002 Denali earthquake of Magnitude 7.9 was the largest inland earthquake recorded in North America in the last 100 years, and occurred at a shallow focal depth of about three miles. The western portion of the Denali fault system is capable of generating large earthquakes of up to about Magnitude 8.0.

In addition to the seismicity associated with the Denali and Kaltag-Tintina fault systems, a significant number of earthquakes within interior Alaska are located in a zone of distributed shear deformation between the two fault systems. These earthquakes are aligned in three major north-northeast trending zones of seismicity, known as the Minto Flats, Fairbanks and Salcha seismic zones. The geological structures that produce this broadly distributed seismicity are not well defined. However, it has been proposed (Page, 1995) that this seismicity is caused by crustal block rotations in response to the crustal stresses imposed by the subducting tectonic plate boundary to the south. The largest earthquakes recorded within this region are events in 1904 and 1937 of Magnitude 7.3, and an event of Magnitude 7.2 in 1947. A study by Fletcher and Christensen (1996) indicated that the 1937 and 1947 earthquakes occurred at focal depths of less than six miles.

A detailed review of mapped faults in the region has not been carried out for this study. However, there are no known faults with surface expression or known Quaternary movement within the project area that would be capable of producing a significant (M6+) earthquake. Nevertheless, instrument-recorded seismicity in the region delineates active fault zones for which no surface expression has been observed. These zones of seismicity appear as northeast trending linear features and include the Minto Flats, Fairbanks and Salcha seismic zones. Recorded earthquakes in these zones typically indicate strike-slip motion characteristics.

3.0 SEISMIC HAZARD ANALYSES

Probabilistic Hazard Analysis

Probabilistic site-specific maximum accelerations have been determined previously for the Ft. Knox project using information provided by the United States Geological Survey (USGS) probabilistic seismic hazard program for Alaska (http://earthquake.usgs.gov/research/hazmaps; Wesson, 1999). Maximum acceleration values have been determined for return periods ranging up to 10,000 years. The results have been summarised in Table 1, in terms of earthquake return period, probability of exceedance (assuming a 50 year design life) and maximum acceleration. For a return period of 500 years (approximately 10% probability of exceedance in 50 years) the corresponding maximum acceleration is 0.2g, implying a moderate seismic hazard.

Information provided by the USGS also includes deaggregation of the seismic hazard to provide the relative contributions to the seismic hazard of potential seismic sources. This allows the expected earthquake characteristics (Magnitude and distance) to be defined for a specific return period. The deaggregation information has been reviewed to define the characteristics of the MDE, required for selection of representative acceleration time-history records.

Deterministic Hazard Analysis

A deterministic seismic hazard analysis has been carried out by considering the known seismic sources and fault systems in the region and applying a maximum earthquake magnitude to each potential source. Unlike the probabilistic analysis, the deterministic method does not account for the likelihood of occurrence of a predicted ground acceleration. The resulting calculated acceleration at the project site for each potential source is considered to be the maximum credible acceleration that can occur, on the basis of available geologic and tectonic information. The maximum acceleration has been calculated for the mean and mean plus one standard deviation values for the appropriate ground motion attenuation relationship for each potential seismic source. A Maximum Credible Earthquake (MCE) is typically associated with the maximum acceleration calculated using the mean plus one standard deviation attenuation relationship value.

The most prominent seismic sources influencing the seismic hazard of central Alaska are the Denali and Kaltag-Tintina fault systems and the Alaska-Aleutian Megathrust, with its associated interface subduction earthquakes. Wesson et al. (2007) indicate that a maximum earthquake magnitude of 9.2 is appropriate for an interface subduction event along the southern coast of Alaska. It should be noted that the level of ground shaking from a great earthquake of Magnitude 9+ is likely to be no larger than that from an event of about Magnitude 8 to 8.5. The shaking will simply cover a bigger area corresponding to a larger rupture zone. Therefore, it is reasonable and accepted practice to use a lower magnitude of about M8 to M8.5 for determining the resulting maximum ground acceleration at a site (Adams and Atkinson, 2003). A maximum Magnitude of 8.0 is appropriate for the Denali fault system, based on historical seismicity (including the M7.9 earthquake in 2002) and geologic findings relating to fault slip rates. Although there is little information defining the seismic potential of the Tintina Fault, a maximum Magnitude of 7.5 has been assumed, based on consideration of potential fault rupture length and historical seismicity.

The closest significant earthquake to the project site was the Magnitude 7.3 event in 1937, located approximately 25 miles (40 km) south of the project site. Although there is no known evidence of seismic activity related to a specific mapped fault close to the site, a conservative hypothetical scenario has been considered for an earthquake of Magnitude 7.5 occurring within the Fairbanks Seismic Zone, in close proximity to the mine site (epicentral distance of three miles). Based on the current knowledge and the historical seismicity, a maximum earthquake in the order of Magnitude 7.3 to 7.5 is considered to be appropriate for the region, and is consistent with other seismic hazard studies (Wesson et al., 2007, Cluff et al., 2003).

For shallow crustal events associated with the Denali Fault, Tintina Fault and the Fairbanks Seismic Zone, the most recent ground motion attenuation relationships developed by Abrahamson & Silva, Boore & Atkinson, Campbell & Bozorgnia, Chiou and Youngs and Idriss were used to predict maximum accelerations at the mine site. Details of each of these five attenuation relationships are provided in Earthquake Spectra (February, 2008). These attenuation relationships, known as the Next Generation of ground motion Attenuation models (NGA), were developed specifically for shallow crustal events in western North American. The reported maximum accelerations for the crustal fault events are mean average values calculated using the five attenuation relationships. An appropriate attenuation relationship provided by Youngs (1997) was used for the interface subduction (Megathrust) event. This relationship was developed specifically for oceanic subduction zone earthquakes.

The potential maximum magnitude for each of the seismic sources, the estimated minimum epicentral distance, focal depth and the calculated maximum acceleration at the project site are presented in Table 2. Calculated values of maximum acceleration are presented for the mean and mean plus one standard deviation attenuation relationships. In addition to earthquake magnitude and source distance, the predicted maximum acceleration is dependent on the type of faulting mechanism. A review of the regional faulting mechanisms indicates that strike-slip faulting is likely the predominant mechanism for the crustal earthquake scenarios considered.

The Maximum Credible Earthquake (MCE) is considered to be the seismic event with potential to cause the highest acceleration (maximum credible acceleration) at a site, based on all known information on the geologic and tectonic conditions in the region. The results of the deterministic seismic analysis presented in Table 2 indicate that a maximum credible acceleration of about 0.6g is appropriate for the Ft. Knox project site (using the mean plus one standard deviation acceleration value), resulting from a hypothetical Magnitude 7.5 shallow crustal event close to the mine site. The predicted maximum credible accelerations at the mine site are less than 0.1g for the Denali Fault, Tintina Fault and the Alaska-Aleutian Megathrust event.

4.0 DESIGN EARTHQUAKES

It is understood that the Maximum Design Earthquake (MDE) for the tailings facility has been defined previously as the 1 in 1,000 year event, with a maximum acceleration on rock of 0.27g (using the USGS probabilistic seismic hazard database). Deaggregation information provided by the USGS seismic hazard model provides the distance and magnitude of potential earthquakes from each seismic source contributing to the ground motion hazard defined by the maximum acceleration. For the 1 in 1,000 year event the deaggregation indicates that the probabilistic contributions to the maximum ground acceleration at the mine site are dominated by local sources (near-field earthquakes within about 10 miles). A representative design Magnitude of 6.5 is considered to be appropriate for the MDE.

The deterministically derived MCE is defined as a near-field Magnitude 7.5 shallow crustal event, with a maximum acceleration of about 0.6g. This value is close to the probabilistic 1 in 10,000 year earthquake event (provided by the USGS probabilistic hazard database) with a maximum acceleration of 0.63g. In regions where specific seismic sources (faults) are not well defined (as with the Fairbanks seismic zone) it is acceptable to adopt the 1 in 10,000 year event as a probabilistically derived MCE. For design purposes it is recommended that the MCE be defined as a near-field Magnitude 7.5 event with a maximum acceleration of 0.63g.

5.0 EARTHQUAKE TIME-HISTORY RECORDS

Appropriate earthquake (acceleration) time-history records have been selected as input ground motions for dynamic response and seismic deformation analyses. Suitable acceleration time-history records of shallow crustal events for the region of interest in Alaska are not available. Therefore, earthquake records for shallow crustal events from other western North America locations (California) have been used. Earthquake records with similar characteristics (Magnitude, epicentral distance, focal depth and response spectrum) to those defined for the MDE and MCE were selected to the extent possible. For the response spectrum the period range of interest is expected to be approximately 0.3 to 2 seconds for the tailings dam, based on consideration of the dam height and expected stiffness characteristics of the dam materials. All of the earthquake time-history records selected were recorded on rock sites.

Additional earthquake records have been provided by developing synthetic records that have a closer match to the site specific hazard conditions (defined by response spectra) for the MCE and MDE events. The synthetic records were developed using the computer program SYNTH (Naumoski, 2001).

Due to the uncertainties inherent in defining the characteristics of earthquake ground motions, such as frequency content and duration, a total of six earthquake records have been selected to represent the MDE event. Three of the time-history records are synthetic earthquakes generated to closely match the target response spectrum for the project site. The site specific target spectrum was developed using the NGA spectral attenuation relationships (Earthquake Spectra, 2008) for a Magnitude 6.5 event with a maximum ground acceleration of 0.27g. The spectral accelerations used are mean average values calculated using the five attenuation relationships. The three natural earthquake records were used to each generate a synthetic record. The target spectrum for the MDE and the corresponding response spectra for the three natural earthquake time-history records are shown on Figure 1. All three records generally match or exceed the target spectrum over the period range of interest. Similarly, the target spectrum for the MDE event and the corresponding response spectra for the three synthetic earthquake time-history records are shown on Figure 2. As expected, the response spectra for the synthetic records match the target spectrum well. Each of the earthquake records were scaled to the maximum acceleration of 0.27g for the MDE.

Details of the natural earthquake time-history records used to represent the MDE are as follows:

Northridge Earthquake, California (January 17, 1994)
Station: Pacoima Dam - Downstream (265° horizontal component)
Magnitude (Mw) = 6.7
Maximum Acceleration = 0.43g
Epicentral Distance = 5 miles (8 km)
Focal Depth = 11 miles (18 km)

San Fernando Earthquake, California (February 9, 1971)
Station: Griffith Park Observatory, L.A. (S00W horizontal component)
Magnitude (Mw) = 6.6
Maximum Acceleration = 0.18g
Epicentral Distance = 19 miles (31 km)
Focal Depth = 5 miles (8 km)

San Fernando Earthquake, California (February 9, 1971)
Station: Lake Hughes, Station 4 (S21W horizontal component)
Magnitude (Mw) = 6.6
Maximum Acceleration = 0.146g
Epicentral Distance = 16 miles (26 km)
Focal Depth = 5 miles (8 km)

Similarly, three earthquake records have been selected to represent the MCE event. One of the time-history records is a synthetic earthquake generated to match the target response spectrum for the Magnitude 7.5 MCE. The Northridge (Pacoima Dam) earthquake record selected for the MDE was also selected for the MCE and used to generate the synthetic time history record. Each of the earthquake records were scaled to the maximum acceleration of 0.63g for the MCE. The target spectrum for the MCE and the corresponding response spectra for the two natural earthquake time-history records and one synthetic record are shown on Figure 3.

Details of the Landers natural earthquake time-history record used to represent the MCE are as follows:

Landers Earthquake, California (June 28, 1992)
Station: Lucerne (270° horizontal component)
Magnitude (Mw) = 7.3
Maximum Acceleration = 0.73g
Epicentral Distance = 5 miles (8 km)
Focal Depth = 0.7 miles (1.1 km)

Both the Northridge (Pacoima Dam) and Landers earthquake time-histories were recorded at a short epicentral distance and exhibit the characteristics of near-source events. The Landers earthquake record exhibits a large “fling” component, characterised by a large peak ground velocity and displacement.

Figures 4 to 6 show the scaled earthquake acceleration time histories selected for the MDE, including both the natural and corresponding synthetic records, for the Pacoima, Griffith Park and Lake Hughes records respectively. Similarly, Figures 7 and 8 show the scaled earthquake acceleration time histories selected for the MCE.

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6.0 REFERENCES

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PROFESSIONAL PROVINCE OF G.R. Greenaway BRITISH COLUMBIA ENGINEER

March 9th 09

Signed: ______________________________
Graham Greenaway, P.Eng. – Specialist Geotechnical Engineer

Approved: ______________________________
Jeremy Haile – President

Attachments:
Table 1 Rev 0 Summary of Probabilistic Seismic Hazard Analysis

Table 2 Rev 0	Summary of Deterministic Seismic Hazard Analysis
Figure 1 Rev 0	Natural Earthquake Response Spectra for the Maximum Design Earthquake (MDE)
Figure 2 Rev 0	Synthetic Earthquake Response Spectra for the Maximum Design Earthquake (MDE)
Figure 3 Rev 0	Earthquake Response Spectra for the Maximum Credible Earthquake (MCE)
Figure 4 Rev 0	Maximum Design Earthquake – Northridge (Pacoima Dam) Time Histories
Figure 5 Rev 0	Maximum Design Earthquake – San Fernando (Griffith Park) Time Histories
Figure 6 Rev 0	Maximum Design Earthquake – San Fernando (Lake Hughes) Time Histories
Figure 7 Rev 0	Maximum Credible Earthquake – Landers (Lucerne) Time History
Figure 8 Rev 0	Maximum Credible Earthquake – Northridge (Pacoima Dam) Time Histories

/grg

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TABLE 1

FAIRBANKS GOLD MINING INC.
FORT KNOX MINE

SUMMARY OF PROBABILISTIC SEISMIC HAZARD ANALYSIS

Print Mar/09/09 13:18:35

Return Period (Years)	Probability of Exceedance[1] (%)	Maximum Acceleration[2] (g)
50	63	0.06
100	39	0.09
200	22	0.13
500	10	0.20
1,000	**5**	**0.27**
2,500	2	0.39
5,000	1	0.51
10,000	**0.5**	**0.63**

M:\1\01\00089\19\A\Correspondence\VA09-00309\[Tables 1 to 2 - Seismic Hazard Analyses r0.XLS]Table 1 - Probabilistic SHA

NOTES:

1. PROBABILITY OF EXCEEDANCE CALCULATED FOR A DESIGN LIFE OF 50 YEARS.

$$q = 1 - \exp(-L/T)$$

WHERE, q = PROBABILITY OF EXCEEDANCE
L = DESIGN LIFE IN YEARS
T = RETURN PERIOD IN YEARS

2. MAXIMUM ACCELERATIONS ARE FOR VALUES ON FIRM ROCK.
3. INFORMATION BASED ON THE USGS SEISMIC HAZARD PROGRAM DATABASE (1998 SEISMIC HAZARD MODEL AND DATA).

0	6MAR'09	ISSUED WITH MEMO VA09-00309	GRG	AG	JPH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2

FAIRBANKS GOLD MINING INC.
FORT KNOX MINE

SUMMARY OF DETERMINISTIC SEISMIC HAZARD ANALYSIS

Print Mar/09/09 13:21:59

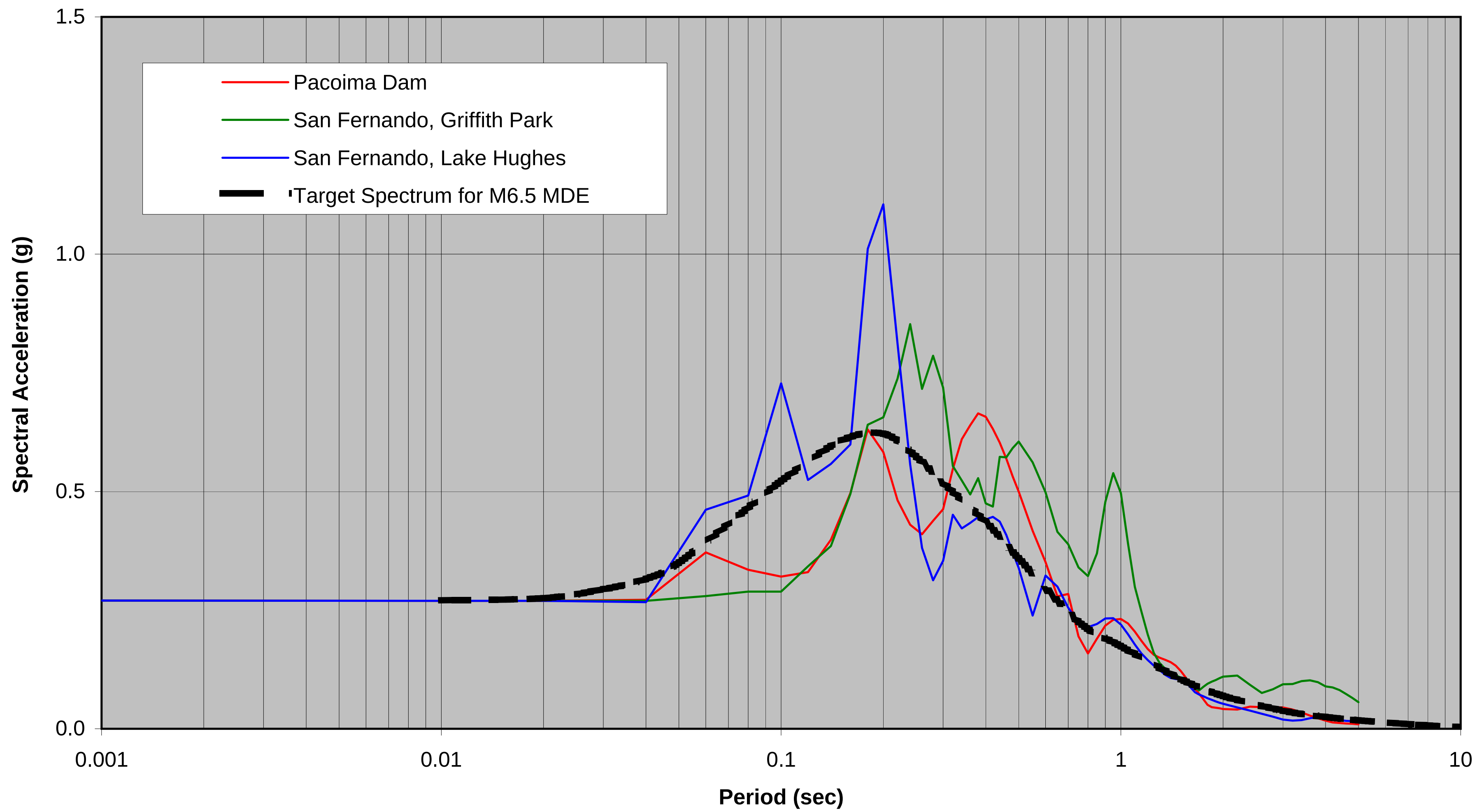
Earthquake Source Type	Earthquake Source	Maximum Magnitude (Mw)	Epicentral Distance (miles)	Focal Depth (miles)	Maximum Acceleration[1] Average (g)	Maximum Acceleration[1] + 1 S.D. (g)
Interface Subduction[2]	Alaska-Aleutian Megathrust	9.2	225	25	0.05 (0.03)	0.09 (0.05)
Shallow Crustal (Strike-Slip Faulting)	Denali Fault	8.0	100	3	0.04	0.06
	Tintina Fault	7.5	60	3	0.05	0.08
	Fairbanks Seismic Zone	7.5	3	3	0.35	0.60

M:\1\01\00089\19\A\Correspondence\VA09-00309\[Tables 1 to 2 - Seismic Hazard Analyses r0.XLS]Table 2 - Deterministic SHA

NOTES:

1. MAXIMUM ACCELERATIONS ARE FOR VALUES ON FIRM ROCK.
2. THE MAXIMUM ACCELERATIONS PROVIDED IN PARENTHESES FOR THE INTERFACE SUBDUCTION (MEGATHRUST) EVENT ARE LIKELY MORE REPRESENTATIVE VALUES THAT ACCOUNT FOR THE VERY LARGE RUPTURE AREA ASSOCIATED WITH A MAGNITUDE 9+ EVENT. THESE MAXIMUM ACCELERATIONS HAVE BEEN CALCULATED USING AN EQUIVALENT MAGNITUDE OF 8.5.

0	6MAR'09	ISSUED WITH MEMO VA09-00309	GRG	AG	JPH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NOTE:
1. EARTHQUAKES SCALED TO 0.27g.

FAIRBANKS GOLD MINING INC.

FORT KNOX MINE

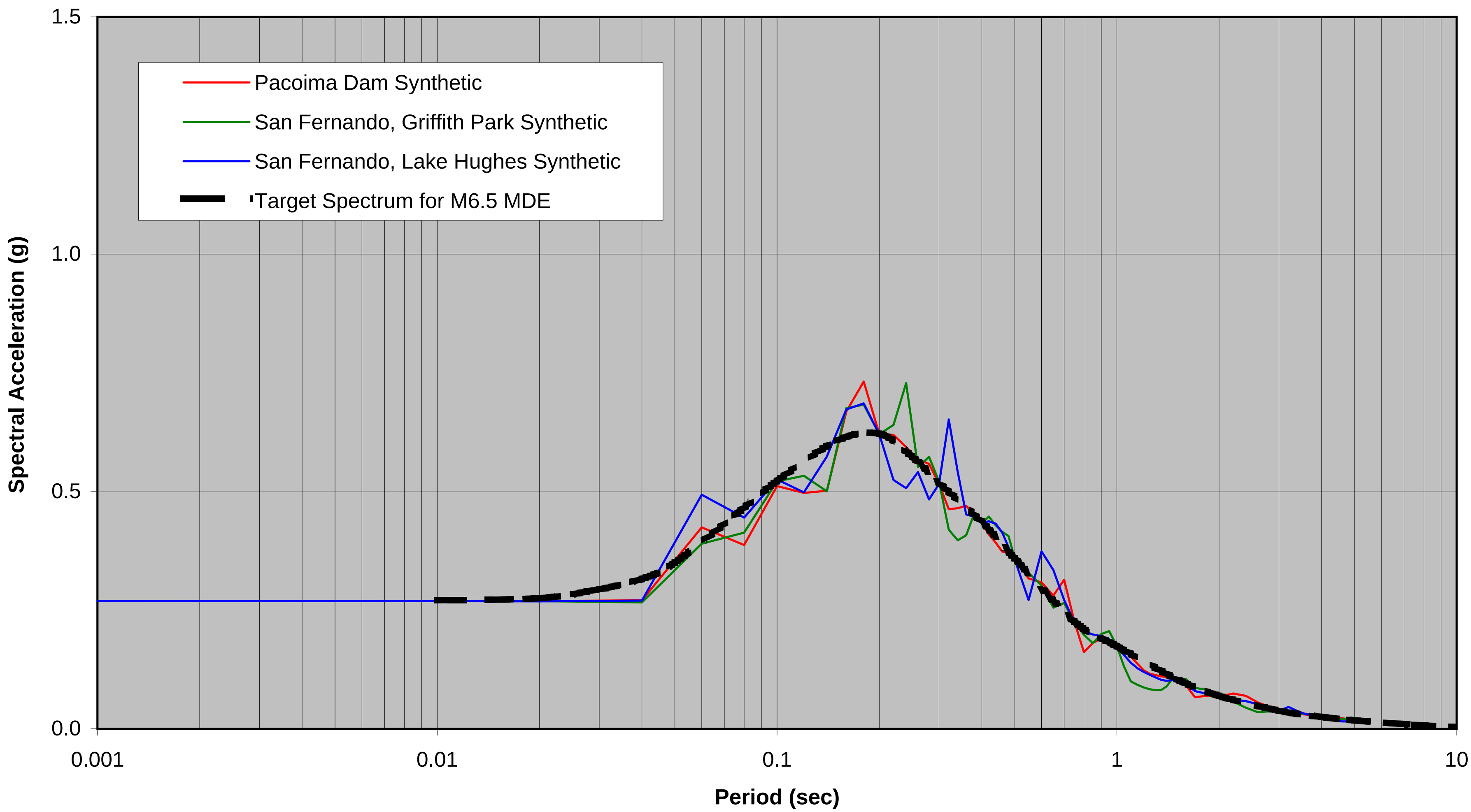
NATURAL EARTHQUAKE RESPONSE SPECTRA FOR THE MAXIMUM DESIGN EARTHQUAKE (MDE)

Knight Piésold CONSULTING

P/A NO.	REF NO.	REV
DV101-89/19	VA09-00309	0

FIGURE 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	6MAR'09	ISSUED WITH MEMO	AG	GRG	JPH



NOTE:
1. EARTHQUAKES SCALED TO 0.27g.

0	6MAR'09	ISSUED WITH MEMO	AG	GRG	JPH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

FAIRBANKS GOLD MINING INC.

FORT KNOX MINE

SYNTHETIC EARTHQUAKE RESPONSE SPECTRA FOR THE MAXIMUM DESIGN EARTHQUAKE (MDE)

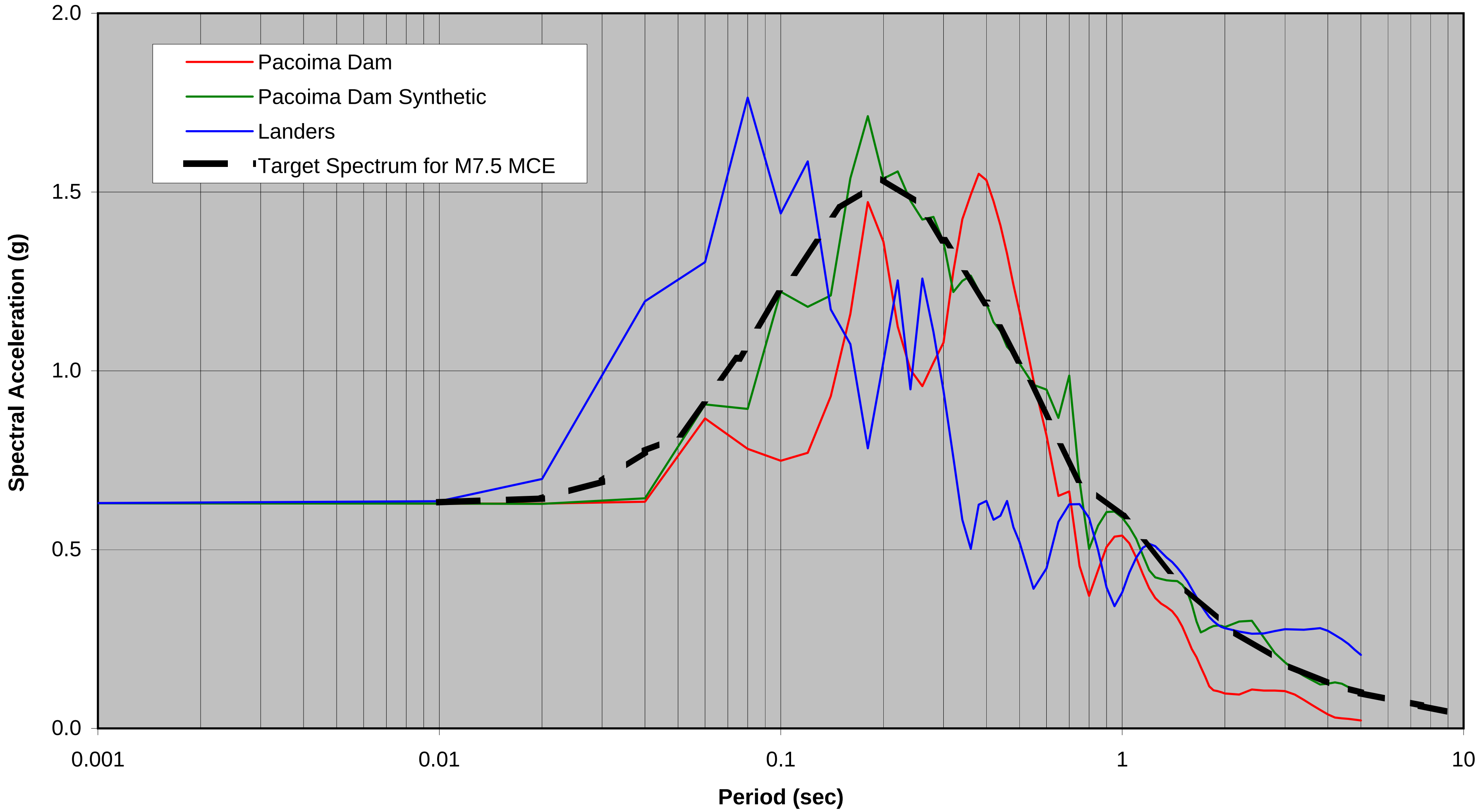
Knight Piésold CONSULTING

P/A NO. DV101-89/19

REF NO. VA09-00309

FIGURE 2

REV 0



NOTE:

1. EARTHQUAKES SCALED TO 0.63g.

0	6MAR'09	ISSUED WITH MEMO	AG	GRG	JPH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

FAIRBANKS GOLD MINING INC.

FORT KNOX MINE

EARTHQUAKE RESPONSE SPECTRA FOR THE MAXIMUM CREDIBLE EARTHQUAKE (MCE)

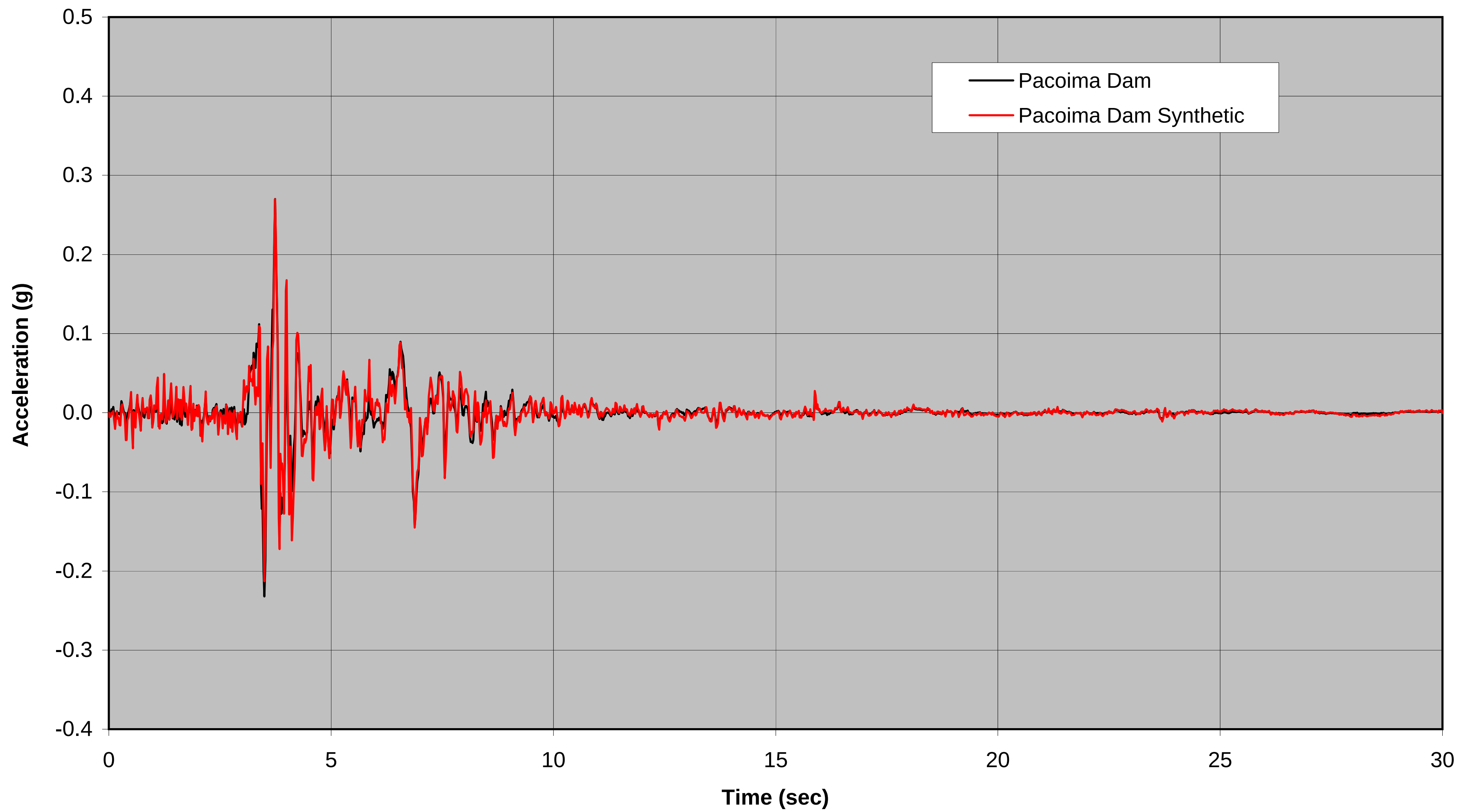
Knight Piésold CONSULTING

P/A NO. DV101-89/19

REF NO. VA09-00309

FIGURE 3

REV 0



NOTE:
1. PEAK ACCELERATION FOR THE MDE IS 0.27g.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	6MAR'09	ISSUED WITH MEMO	AG	GRG	JPH

FAIRBANKS GOLD MINING INC.

FORT KNOX MINE

MAXIMUM DESIGN EARTHQUAKE
NORTHRIDGE (PACOIMA DAM) TIME HISTORIES

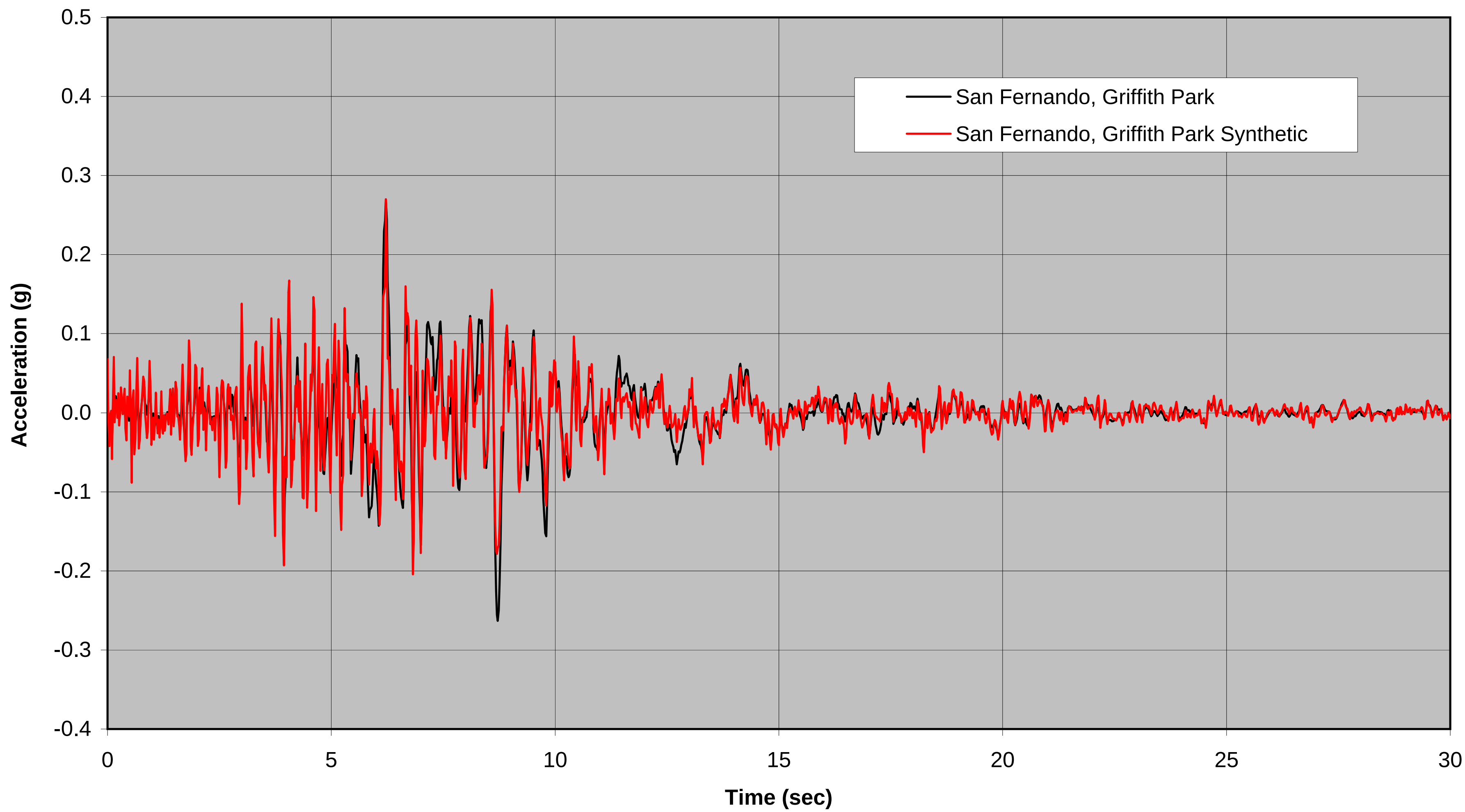
Knight Piésold CONSULTING

P/A NO. DV101-89/19

REF NO. VA09-00309

FIGURE 4

REV 0



NOTE:
1. PEAK ACCELERATION FOR THE MDE IS 0.27g.

0	6MAR'09	ISSUED WITH MEMO	AG	GRG	JPH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

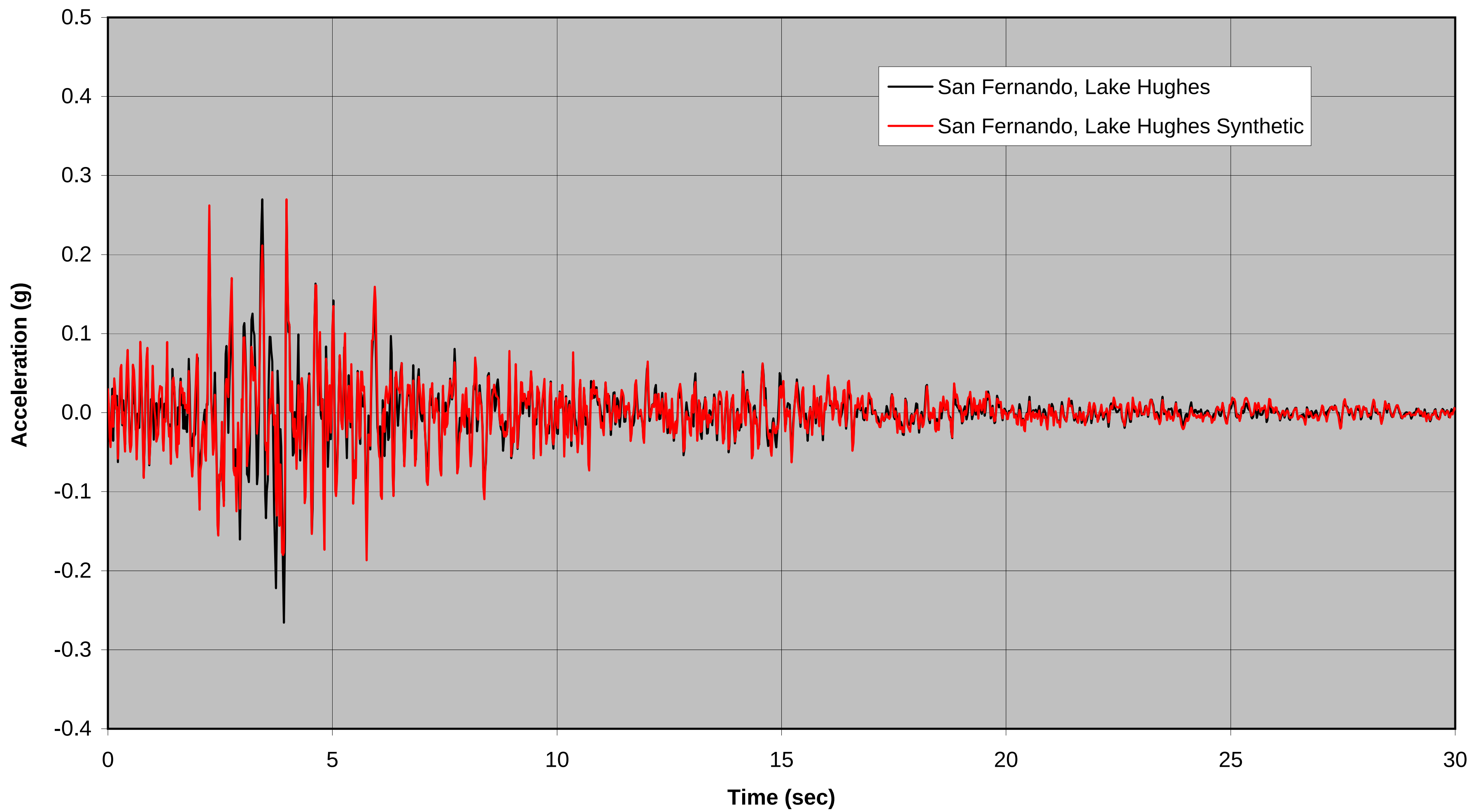
FAIRBANKS GOLD MINING INC.

FORT KNOX MINE

MAXIMUM DESIGN EARTHQUAKE
SAN FERNANDO (GRIFFITH PARK) TIME HISTORIES

Knight Piésold CONSULTING

P/A NO.	REF NO.	
DV101-89/19	VA09-00309	
FIGURE 5		REV 0



NOTE:
1. PEAK ACCELERATION FOR THE MDE IS 0.27g.

0	6MAR'09	ISSUED WITH MEMO	AG	GRG	JPH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

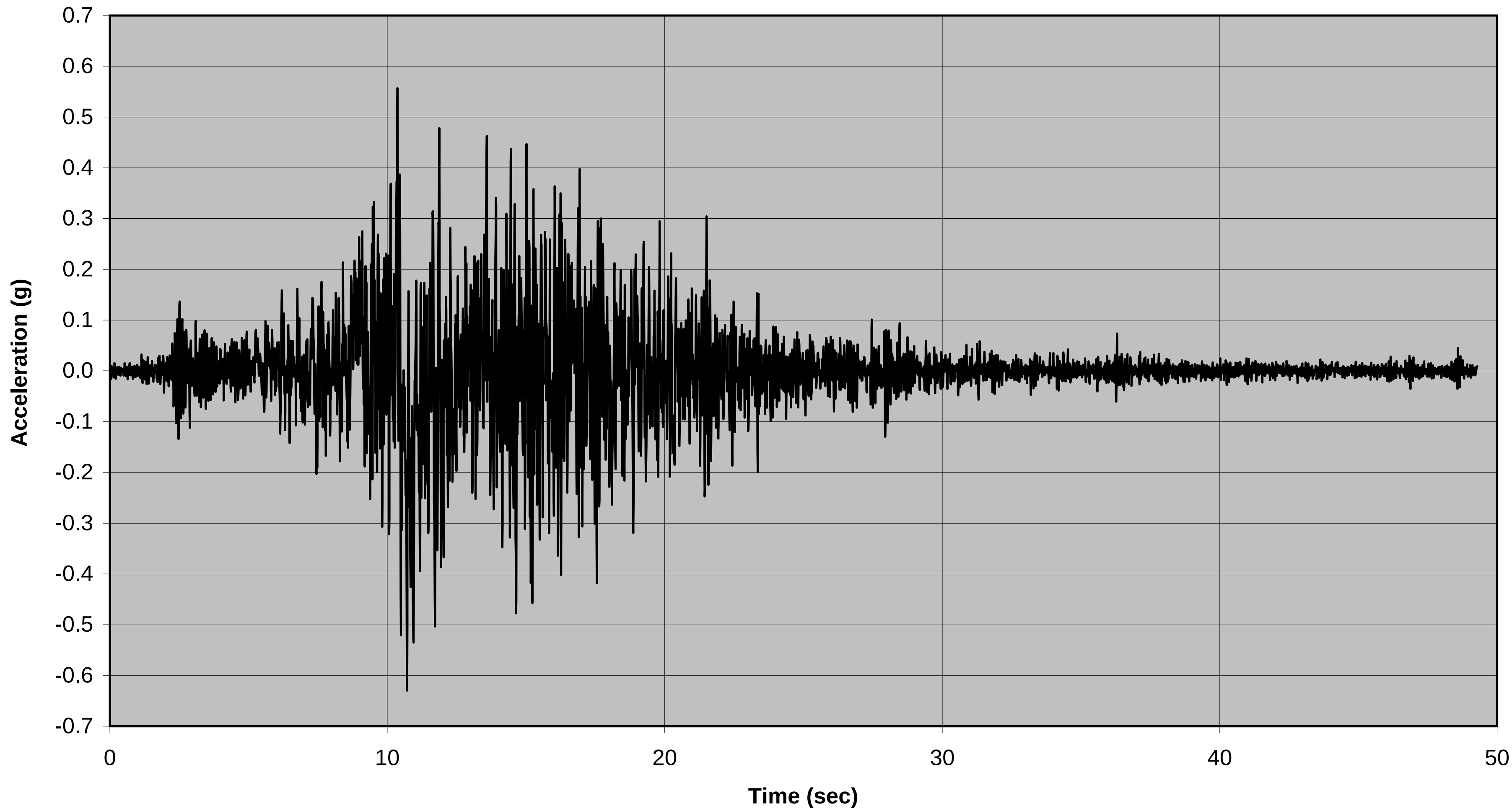
FAIRBANKS GOLD MINING INC.

FORT KNOX MINE

MAXIMUM DESIGN EARTHQUAKE
SAN FERNANDO (LAKE HUGHES) TIME HISTORIES

Knight Piésold CONSULTING

P/A NO. DV101-89/19	REF NO. VA09-00309	
FIGURE 6		REV 0



NOTE:
1. PEAK ACCELERATION FOR THE MCE IS 0.63g.

0	6MAR'09	ISSUED WITH MEMO	AG	GRG	JPH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

FAIRBANKS GOLD MINING INC.

FORT KNOX MINE

MAXIMUM CREDIBLE EARTHQUAKE LANDERS (LUCERNE) TIME HISTORY

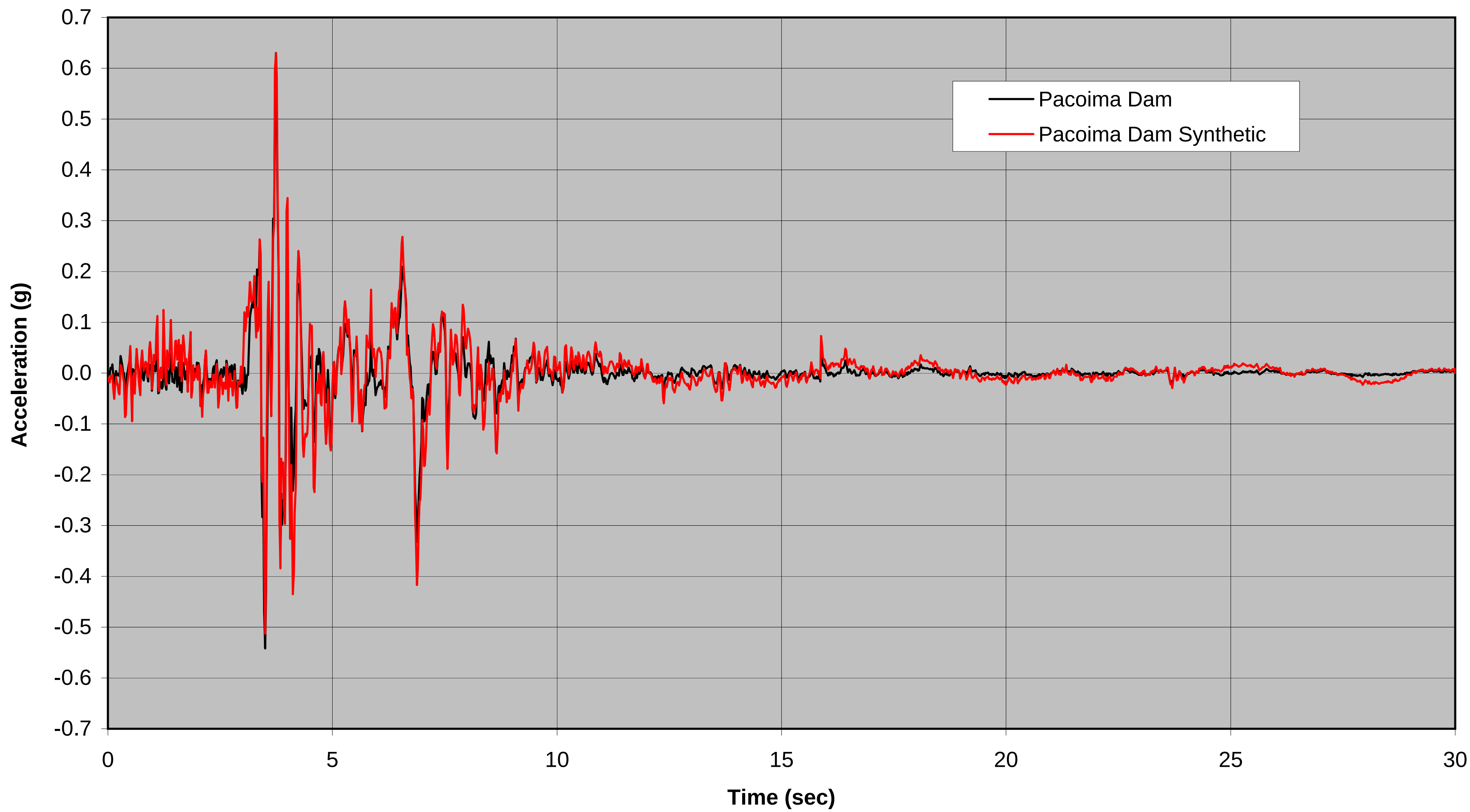
Knight Piésold CONSULTING

P/A NO. DV101-89/19

REF NO. VA09-00309

FIGURE 7

REV 0



NOTE:
1. PEAK ACCELERATION FOR THE MCE IS 0.63g.

0	6MAR'09	ISSUED WITH MEMO	AG	GRG	JPH
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

FAIRBANKS GOLD MINING INC.

FORT KNOX MINE

MAXIMUM CREDIBLE EARTHQUAKE
NORTHRIDGE (PACOIMA DAM) TIME HISTORIES

Knight Piésold CONSULTING

P/A NO. DV101-89/19

REF NO. VA09-00309

FIGURE 8

REV 0

GeoPentech

April 22, 2016
Project No. 16030A

Mr. Jordan Scheremeta, P.E.
Knight Piesold and Co.
1999 Broadway
Suite 600
Denver, CO 80202

SUBJECT: ACCELERATION TIME HISTORY MATCHING
ALASKAN TAILINGS DAM PROJECT
FAIRBANKS, ARIZONA

Dear Mr. Scheremeta:

As requested we have completed the spectral matching for earthquake acceleration time histories to be used in the nonlinear deformation analysis of the subject project and have documented our findings in the accompanying letter report. This letter report and digital attachments contain the recommended acceleration time histories spectrally matched to the Maximum Considered Earthquake (MCE) spectrum developed by Knight Piesold to be used in site response and nonlinear deformation analyses for the subject project.

We trust that this letter report meets the present needs of the project. If you should have any questions, please call us at your convenience.

Very truly yours,

GeoPentech, Inc.

Sarkis Tatusian, CE, GE
Principal

Andrew Dinsick, CE
Associate

Alexandra Sarmiento, PG, CEG
Assistant Project Professional

1.0 Introduction

It is our understanding that Knight Piesold and Co. is the geotechnical engineer of record for the design of an approximately 400-ft tall tailings dam north of Fairbanks, Alaska. We understand that a Maximum Considered Earthquake (MCE) response spectrum has been developed for the project based on a seismic hazard analysis conducted by Knight Piesold. We also understand that ground motion time histories are needed to conduct a nonlinear response history analysis of the tailings dam using the computation platform FLAC. Knight Piesold has selected three time histories to use in this analysis and scaled these time histories to the target PGA.

Based on preliminary analyses, the variability in the long period ground motion intensity between the three scaled time histories has created significant uncertainty in the calculated seismically induced displacement. For this reason, we have provided time histories spectrally matched to the design MCE spectrum. This letter report presents the methodology and results of the spectral matching performed to support the deformation analyses for the project.

2.0 Maximum Considered Earthquake (MCE) and Seed Time Histories

The tailings dam is being evaluated for the MCE which corresponds to the 10,000-yr return period Peak Ground Acceleration (PGA) of 0.63g. This PGA is based on the result of the USGS 2007 seismic hazard calculation for the state of Alaska. It is understood that this PGA is largely controlled by shallow crustal earthquakes, for this reason the NGA West 2 GMPEs were used to determine the scenario response spectrum that would result in the 10,000 yr PGA. As presented by Knight Piesold, the scenario event is a M_W 7.5 strike-slip earthquake at a closest distance of 8.05 km, evaluated at the 84th percentile. The response spectra for this scenario event is presented in Table 1, this spectrum was based on the NGA W2 models including Abrahamson et al., 2014; Boore et al., 2014; Campbell and Bozorgnia, 2014; Chiou and Youngs, 2014 and; Idriss, 2014. These models were each given 1/5 weight in the development of the MCE spectrum.

Three seed time histories were selected for the seismic deformation analysis. The first was the fault normal orientation recording from the Lucerne Station of the Landers Earthquake (GM1). It is noted that this recording is a classic example of near-field ground motion and exhibits strong pulse-like characteristics. Additionally, the original, uncorrected recording has a substantial co-seismic offset that was due to the permanent ground displacement at the recording station. Prior to matching, this recording was filtered and baseline corrected to remove the co-seismic offset; it was also re-sampled from 0.004 seconds to a time step of 0.02 seconds to minimize the required analysis time.

The second and third seed time histories were both recordings from the Pacoima Dam Station of the Northridge Earthquake. The first Pacoima Dam Station (GM2) was the filtered and baseline corrected natural recording; the second Pacoima Dam Synthetic (GM3) was a synthetic time history developed based on the Pacoima recording that has alternative time-domain characteristics to GM2. Both GM2 and GM3 were truncated to remove excessive quite portions of the record to minimize the required analysis time.

All three seed time histories were selected and provided digitally to GeoPentech by Knight Piesold; additional details pertaining to the selection process have been documented in the analysis report for the tailings dam.

3.0 Analysis Time History Development

Spectral matching of each recording from was performed matched using the program RspMatch, developed by Dr. Norm Abrahamson (Al Atik and Abrahamson, 2010). The program iteratively arrives at an acceleration time history with a reasonable spectral match by adding tapered cosine wavelets to the seed time history in the time domain. This approach has fast convergence properties and allows for efficient and consistent modification of acceleration time histories. For this project, the time history matching of all three time histories targeted a tight spectral match over a period range of 0.01-second to 5.0-seconds.

The acceleration, velocity, displacement time histories and response spectra for each ground motion matched to the MCE spectrum are shown on Figures 1 through 3 for visual inspection. Table 1 shows the response spectral ordinates at 200 equally log-spaced periods between 0.01 and 10 seconds. As noted in Table 1 the matched time histories generally have spectral intensities that are within a few percent of the smooth target spectrum up to a period of 5 seconds. It is noted that the PGA on all three records is within 1% of the target PGA which is important with respect to capturing the appropriate liquefaction triggering response in the system.

The three recommended matched acceleration time histories are each provided as a digital appendix to this letter report for use in the site response and deformation analyses.

4.0 Conclusions, Recommendations, and Limitations

Based on the results of the spectral matching documented herein, the time histories can be further truncated, if needed, provided that it can be demonstrated that the sliding mass in the analysis is adequately stable at the end of strong shaking. It is acceptable to truncate the time histories at a time that is conditional on two observations: 1) at least 95% of the seismic energy has been experience (this can be determined through inspection of the record Arias Intensity) and 2) the peak spectral demands in the period range of interest have already been observed in the record. For GM1, these conditions are satisfied 25 seconds into the record and for GM2 and GM3, these conditions are satisfied 20 seconds into the record.

Conclusions and recommendations presented in this report are based upon GeoPentech's understanding of the project, information provided to us, and the assumption that the subsurface conditions do not deviate appreciably from the information provided to us.

Professional judgments presented in this report are based on an evaluation of the technical information gathered and GeoPentech's general experience in the field of geotechnical engineering. GeoPentech does not guarantee the performance of the project in any respect, only that the engineering work and judgment rendered meet the standard of care of the geotechnical profession at this time.

5.0 References

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Table 1 - Response Spectrum Check

Period	Target MCE	GM1	Misfit	GM2	Misfit	GM3	Misfit
T (s)	SA (g)	SA (g)	(%)	SA (g)	(%)	SA (g)	(%)
0.010	0.637	0.628	-1%	0.634	0%	0.637	0%
0.010	0.636	0.626	-2%	0.630	-1%	0.636	0%
0.011	0.635	0.620	-2%	0.633	0%	0.637	0%
0.011	0.634	0.625	-1%	0.639	1%	0.642	1%
0.011	0.634	0.640	1%	0.634	0%	0.647	2%
0.012	0.633	0.646	2%	0.639	1%	0.651	3%
0.012	0.633	0.642	1%	0.637	1%	0.651	3%
0.013	0.632	0.631	0%	0.631	0%	0.642	1%
0.013	0.632	0.618	-2%	0.641	1%	0.626	-1%
0.014	0.632	0.605	-4%	0.635	0%	0.614	-3%
0.014	0.632	0.599	-5%	0.626	-1%	0.612	-3%
0.015	0.633	0.599	-5%	0.641	1%	0.617	-2%
0.015	0.633	0.614	-3%	0.636	0%	0.622	-2%
0.016	0.634	0.639	1%	0.622	-2%	0.628	-1%
0.016	0.635	0.650	2%	0.638	0%	0.635	0%
0.017	0.637	0.637	0%	0.656	3%	0.639	0%
0.017	0.639	0.621	-3%	0.651	2%	0.638	0%
0.018	0.641	0.616	-4%	0.639	0%	0.633	-1%
0.019	0.644	0.618	-4%	0.633	-2%	0.630	-2%
0.019	0.647	0.624	-3%	0.634	-2%	0.634	-2%
0.020	0.650	0.632	-3%	0.636	-2%	0.640	-2%
0.021	0.654	0.636	-3%	0.634	-3%	0.641	-2%
0.021	0.659	0.637	-3%	0.623	-5%	0.634	-4%
0.022	0.664	0.629	-5%	0.605	-9%	0.628	-5%
0.023	0.669	0.624	-7%	0.594	-11%	0.626	-6%
0.024	0.675	0.655	-3%	0.612	-9%	0.629	-7%
0.025	0.681	0.640	-6%	0.658	-3%	0.639	-6%
0.026	0.687	0.590	-14%	0.693	1%	0.651	-5%
0.026	0.694	0.635	-8%	0.673	-3%	0.661	-5%
0.027	0.701	0.684	-2%	0.659	-6%	0.667	-5%
0.028	0.708	0.705	-1%	0.607	-14%	0.672	-5%
0.029	0.716	0.719	0%	0.626	-13%	0.682	-5%
0.030	0.724	0.714	-1%	0.684	-5%	0.696	-4%
0.031	0.732	0.706	-4%	0.734	0%	0.711	-3%
0.033	0.741	0.716	-3%	0.712	-4%	0.722	-3%
0.034	0.750	0.705	-6%	0.646	-14%	0.723	-4%
0.035	0.759	0.670	-12%	0.711	-6%	0.712	-6%
0.036	0.769	0.645	-16%	0.722	-6%	0.691	-10%
0.037	0.779	0.629	-19%	0.675	-13%	0.660	-15%
0.039	0.790	0.614	-22%	0.628	-21%	0.624	-21%
0.040	0.802	0.671	-16%	0.727	-9%	0.586	-27%
0.042	0.814	0.727	-11%	0.792	-3%	0.650	-20%
0.043	0.827	0.746	-10%	0.794	-4%	0.706	-15%
0.044	0.840	0.761	-9%	0.754	-10%	0.736	-12%
0.046	0.855	0.844	-1%	0.719	-16%	0.741	-13%
0.048	0.871	0.867	0%	0.641	-26%	0.772	-11%
0.049	0.888	0.838	-6%	0.739	-17%	0.735	-17%
0.051	0.906	0.809	-11%	0.844	-7%	0.660	-27%
0.053	0.925	0.845	-9%	0.903	-2%	0.728	-21%
0.055	0.945	0.913	-3%	0.898	-5%	0.787	-17%
0.057	0.966	0.942	-2%	0.825	-15%	0.841	-13%

Table 1 - Response Spectrum Check

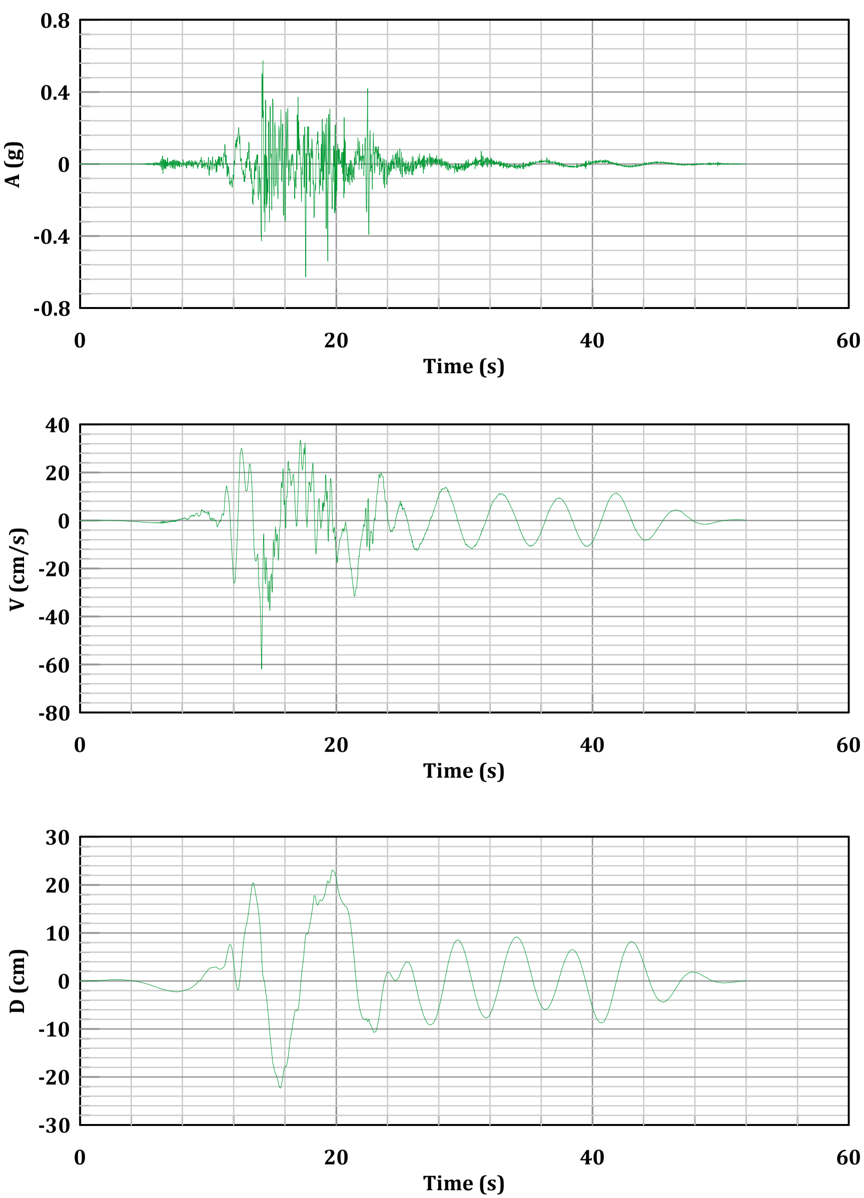
Period	Target MCE		GM1	Misfit		GM2	Misfit		GM3	Misfit
T (s)	SA (g)		SA (g)	(%)		SA (g)	(%)		SA (g)	(%)
0.059	0.988		1.001	1%		0.874	-12%		0.892	-10%
0.061	1.010		0.917	-9%		0.986	-2%		0.942	-7%
0.063	1.033		0.962	-7%		1.015	-2%		0.994	-4%
0.065	1.056		1.011	-4%		0.946	-10%		1.042	-1%
0.067	1.079		1.014	-6%		0.917	-15%		1.083	0%
0.070	1.102		1.052	-5%		0.915	-17%		1.113	1%
0.072	1.125		1.121	0%		1.048	-7%		1.130	0%
0.075	1.147		1.087	-5%		1.049	-9%		1.133	-1%
0.078	1.168		1.040	-11%		1.124	-4%		1.125	-4%
0.080	1.189		1.156	-3%		1.151	-3%		1.111	-7%
0.083	1.209		1.131	-6%		1.139	-6%		1.153	-5%
0.086	1.228		1.213	-1%		1.097	-11%		1.226	0%
0.089	1.246		1.222	-2%		1.051	-16%		1.250	0%
0.092	1.265		1.238	-2%		1.134	-10%		1.228	-3%
0.095	1.283		1.230	-4%		1.193	-7%		1.161	-10%
0.099	1.301		1.233	-5%		1.231	-5%		1.149	-12%
0.102	1.320		1.235	-6%		1.249	-5%		1.322	0%
0.106	1.338		1.298	-3%		1.246	-7%		1.312	-2%
0.110	1.357		1.261	-7%		1.220	-10%		1.343	-1%
0.114	1.375		1.363	-1%		1.230	-11%		1.375	0%
0.118	1.392		1.288	-8%		1.288	-8%		1.410	1%
0.122	1.409		1.371	-3%		1.368	-3%		1.429	1%
0.126	1.424		1.424	0%		1.342	-6%		1.432	1%
0.130	1.438		1.405	-2%		1.396	-3%		1.420	-1%
0.135	1.450		1.413	-3%		1.389	-4%		1.394	-4%
0.140	1.461		1.440	-1%		1.333	-9%		1.358	-7%
0.145	1.468		1.481	1%		1.410	-4%		1.402	-5%
0.150	1.474		1.470	0%		1.436	-3%		1.447	-2%
0.155	1.476		1.382	-6%		1.422	-4%		1.474	0%
0.161	1.476		1.470	0%		1.378	-7%		1.484	1%
0.166	1.473		1.462	-1%		1.319	-10%		1.475	0%
0.172	1.467		1.439	-2%		1.359	-7%		1.445	-2%
0.178	1.460		1.453	0%		1.368	-6%		1.393	-5%
0.185	1.450		1.419	-2%		1.349	-7%		1.428	-2%
0.191	1.438		1.409	-2%		1.307	-9%		1.436	0%
0.198	1.425		1.398	-2%		1.341	-6%		1.411	-1%
0.205	1.410		1.390	-1%		1.337	-5%		1.365	-3%
0.212	1.393		1.365	-2%		1.297	-7%		1.384	-1%
0.220	1.375		1.370	0%		1.317	-4%		1.367	-1%
0.227	1.356		1.323	-2%		1.303	-4%		1.319	-3%
0.235	1.336		1.311	-2%		1.275	-5%		1.321	-1%
0.244	1.314		1.262	-4%		1.277	-3%		1.301	-1%
0.252	1.291		1.255	-3%		1.247	-3%		1.254	-3%
0.261	1.267		1.283	1%		1.213	-4%		1.249	-1%
0.270	1.242		1.226	-1%		1.201	-3%		1.227	-1%
0.280	1.218		1.184	-3%		1.171	-4%		1.201	-1%
0.290	1.193		1.179	-1%		1.131	-5%		1.191	0%
0.300	1.169		1.108	-5%		1.098	-6%		1.160	-1%
0.311	1.146		1.096	-4%		1.085	-5%		1.134	-1%
0.322	1.123		1.087	-3%		1.065	-5%		1.101	-2%
0.333	1.101		1.099	0%		1.042	-5%		1.083	-2%

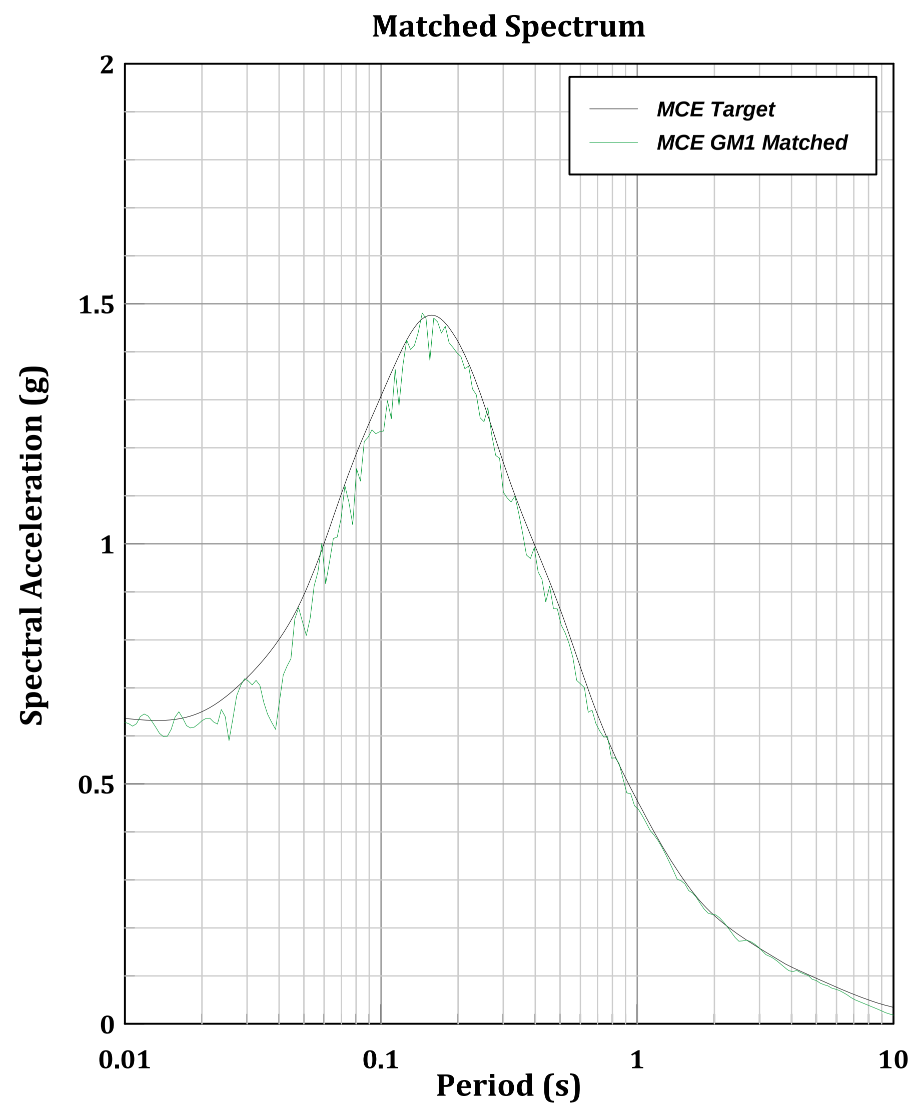
Table 1 - Response Spectrum Check

Period	Target MCE		GM1	Misfit		GM2	Misfit		GM3	Misfit
T (s)	SA (g)		SA (g)	(%)		SA (g)	(%)		SA (g)	(%)
0.345	1.080		1.064	-2%		1.015	-6%		1.052	-3%
0.357	1.059		1.022	-4%		1.003	-5%		1.011	-5%
0.370	1.039		0.977	-6%		0.994	-4%		1.033	-1%
0.383	1.019		0.970	-5%		0.976	-4%		0.981	-4%
0.396	0.999		0.992	-1%		0.953	-5%		0.996	0%
0.410	0.980		0.942	-4%		0.946	-3%		1.009	3%
0.425	0.960		0.926	-4%		0.926	-4%		0.987	3%
0.440	0.941		0.879	-7%		0.906	-4%		0.938	0%
0.455	0.921		0.912	-1%		0.885	-4%		0.868	-6%
0.471	0.901		0.865	-4%		0.864	-4%		0.875	-3%
0.488	0.880		0.864	-2%		0.839	-5%		0.886	1%
0.505	0.858		0.831	-3%		0.819	-5%		0.811	-5%
0.523	0.835		0.814	-3%		0.801	-4%		0.837	0%
0.542	0.812		0.793	-2%		0.779	-4%		0.822	1%
0.561	0.789		0.764	-3%		0.757	-4%		0.783	-1%
0.581	0.766		0.716	-7%		0.737	-4%		0.735	-4%
0.601	0.742		0.708	-5%		0.714	-4%		0.717	-3%
0.622	0.719		0.700	-3%		0.694	-3%		0.722	0%
0.644	0.696		0.649	-7%		0.671	-4%		0.677	-3%
0.667	0.674		0.654	-3%		0.652	-3%		0.658	-2%
0.691	0.653		0.626	-4%		0.631	-3%		0.644	-1%
0.715	0.632		0.609	-4%		0.614	-3%		0.632	0%
0.740	0.612		0.598	-2%		0.596	-3%		0.606	-1%
0.766	0.593		0.598	1%		0.579	-2%		0.559	-6%
0.793	0.575		0.554	-4%		0.561	-2%		0.553	-4%
0.821	0.557		0.554	-1%		0.545	-2%		0.536	-4%
0.850	0.540		0.542	0%		0.528	-2%		0.538	0%
0.880	0.523		0.511	-2%		0.511	-2%		0.540	3%
0.912	0.507		0.481	-5%		0.494	-3%		0.535	5%
0.944	0.491		0.480	-2%		0.474	-3%		0.523	6%
0.977	0.476		0.454	-4%		0.453	-5%		0.501	5%
1.012	0.460		0.446	-3%		0.442	-4%		0.472	2%
1.047	0.445		0.433	-3%		0.438	-2%		0.444	0%
1.084	0.430		0.418	-3%		0.430	0%		0.438	2%
1.123	0.415		0.403	-3%		0.418	1%		0.430	4%
1.162	0.400		0.394	-2%		0.405	1%		0.415	4%
1.203	0.386		0.382	-1%		0.388	1%		0.397	3%
1.246	0.372		0.369	-1%		0.371	0%		0.377	1%
1.290	0.358		0.354	-1%		0.352	-2%		0.357	0%
1.335	0.345		0.337	-2%		0.335	-3%		0.339	-2%
1.383	0.332		0.319	-4%		0.318	-4%		0.323	-3%
1.431	0.320		0.301	-6%		0.304	-5%		0.310	-3%
1.482	0.308		0.298	-3%		0.292	-5%		0.299	-3%
1.534	0.297		0.292	-2%		0.283	-5%		0.289	-3%
1.589	0.286		0.278	-3%		0.274	-4%		0.281	-2%
1.645	0.275		0.273	-1%		0.267	-3%		0.273	-1%
1.703	0.265		0.263	-1%		0.259	-2%		0.267	1%
1.763	0.255		0.251	-2%		0.252	-1%		0.261	2%
1.825	0.247		0.239	-3%		0.244	-1%		0.255	4%
1.890	0.238		0.231	-3%		0.236	-1%		0.249	4%
1.956	0.230		0.228	-1%		0.229	0%		0.242	5%

Table 1 - Response Spectrum Check

Period	Target MCE		GM1	Misfit		GM2	Misfit		GM3	Misfit
T (s)	SA (g)		SA (g)	(%)		SA (g)	(%)		SA (g)	(%)
2.026	0.223		0.227	2%		0.223	0%		0.234	5%
2.097	0.216		0.221	3%		0.218	1%		0.226	5%
2.171	0.209		0.212	2%		0.213	2%		0.219	5%
2.248	0.203		0.202	0%		0.209	3%		0.211	4%
2.327	0.197		0.191	-3%		0.205	4%		0.204	4%
2.409	0.191		0.180	-6%		0.201	5%		0.197	3%
2.495	0.186		0.172	-7%		0.197	6%		0.190	2%
2.583	0.180		0.173	-4%		0.193	7%		0.183	2%
2.674	0.175		0.174	-1%		0.189	8%		0.182	4%
2.768	0.170		0.172	1%		0.184	8%		0.177	4%
2.866	0.165		0.166	1%		0.179	9%		0.166	1%
2.967	0.159		0.160	0%		0.173	9%		0.165	3%
3.072	0.154		0.152	-1%		0.167	8%		0.165	7%
3.181	0.149		0.144	-3%		0.160	7%		0.164	10%
3.293	0.144		0.141	-2%		0.153	6%		0.161	12%
3.409	0.139		0.136	-2%		0.145	4%		0.156	12%
3.530	0.134		0.130	-3%		0.137	2%		0.150	12%
3.654	0.130		0.123	-5%		0.129	0%		0.144	11%
3.783	0.125		0.116	-7%		0.139	11%		0.137	9%
3.917	0.121		0.110	-9%		0.129	7%		0.134	11%
4.055	0.117		0.109	-7%		0.115	-1%		0.131	12%
4.199	0.113		0.112	-1%		0.111	-1%		0.126	12%
4.347	0.109		0.107	-2%		0.113	3%		0.121	11%
4.501	0.106		0.104	-2%		0.111	5%		0.115	8%
4.660	0.102		0.101	-2%		0.108	5%		0.108	6%
4.824	0.099		0.093	-6%		0.103	4%		0.106	7%
4.995	0.095		0.090	-5%		0.097	2%		0.104	9%
5.171	0.092		0.085	-7%		0.095	4%		0.099	8%
5.354	0.088		0.082	-7%		0.093	6%		0.094	6%
5.543	0.084		0.080	-6%		0.089	5%		0.085	0%
5.738	0.081		0.075	-8%		0.082	1%		0.079	-3%
5.941	0.077		0.072	-7%		0.074	-5%		0.073	-5%
6.151	0.074		0.070	-6%		0.067	-9%		0.067	-9%
6.368	0.070		0.066	-7%		0.061	-13%		0.061	-13%
6.593	0.067		0.060	-10%		0.055	-17%		0.055	-19%
6.826	0.064		0.055	-14%		0.049	-23%		0.048	-25%
7.067	0.061		0.050	-17%		0.043	-28%		0.042	-31%
7.317	0.057		0.046	-19%		0.038	-34%		0.036	-37%
7.575	0.054		0.044	-20%		0.032	-40%		0.033	-40%
7.843	0.051		0.041	-21%		0.028	-46%		0.030	-42%
8.120	0.049		0.037	-23%		0.023	-52%		0.027	-44%
8.407	0.046		0.034	-26%		0.021	-55%		0.025	-46%
8.704	0.043		0.030	-30%		0.018	-58%		0.023	-47%
9.011	0.041		0.027	-35%		0.016	-60%		0.021	-49%
9.329	0.039		0.024	-39%		0.015	-62%		0.019	-51%
9.659	0.036		0.021	-43%		0.013	-64%		0.017	-53%
10.000	0.034		0.018	-47%		0.012	-66%		0.016	-54%

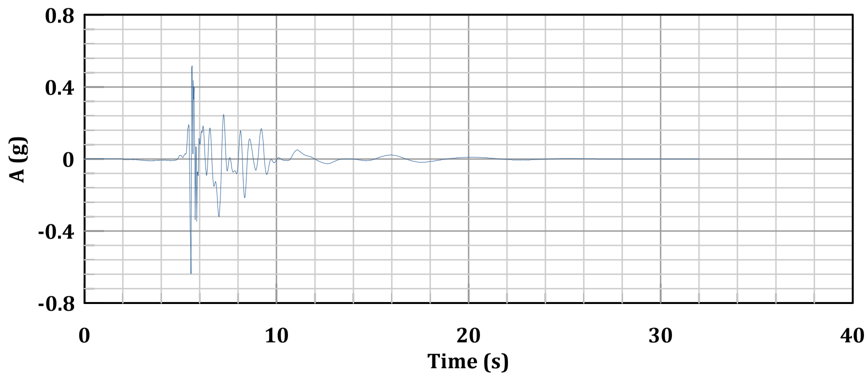


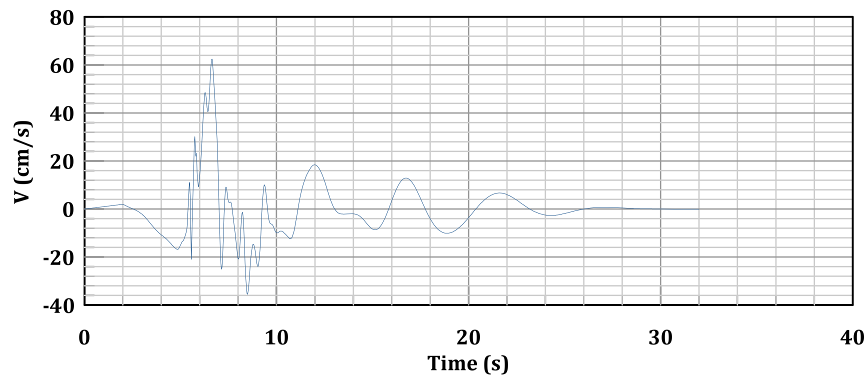


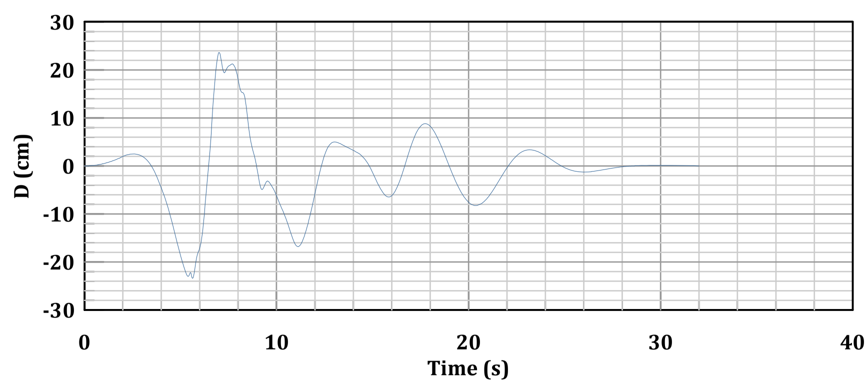
GM1 - Landers Eqk - Lucerne Station, Matched MCE Spectrum

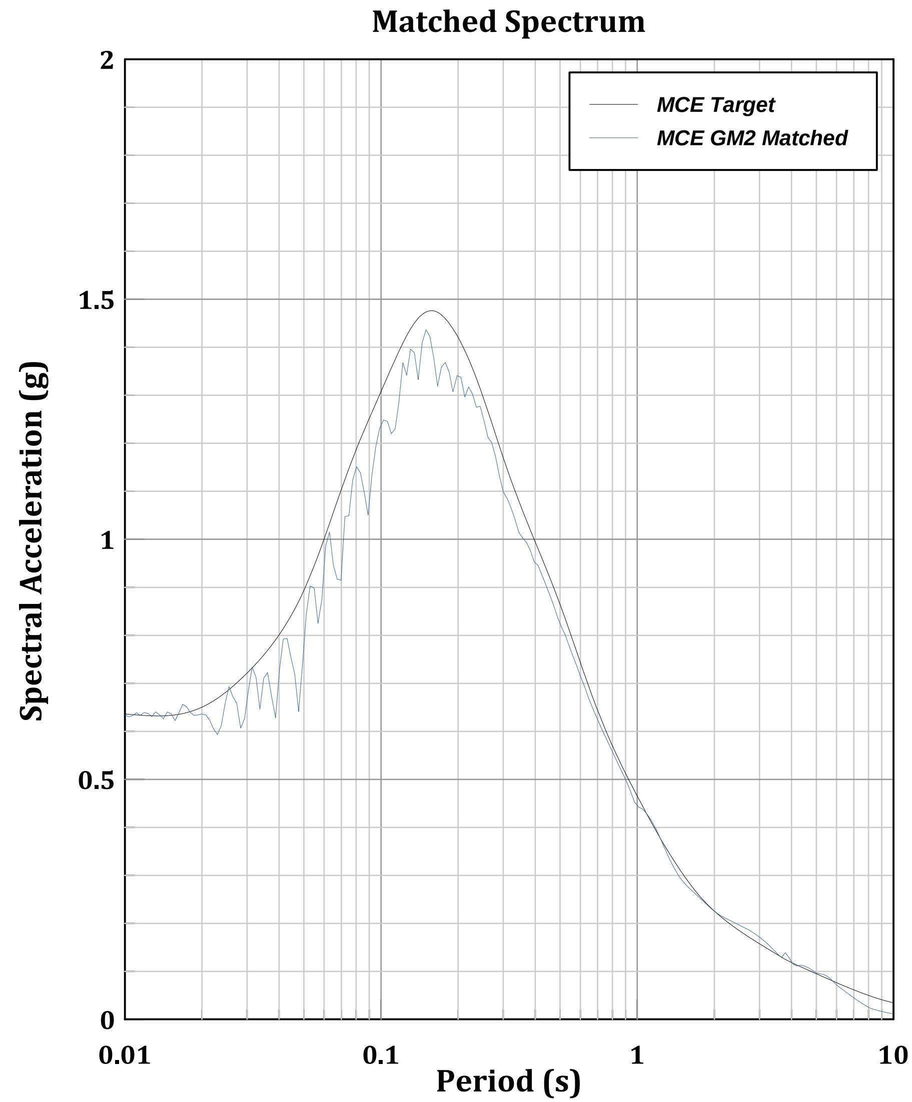
Project No.: 15030A	Project: ALASKAN TAILINGS DAM - GROUND MOTION MATCHING	Date: APR 2016	Figure 1

GeoPentech





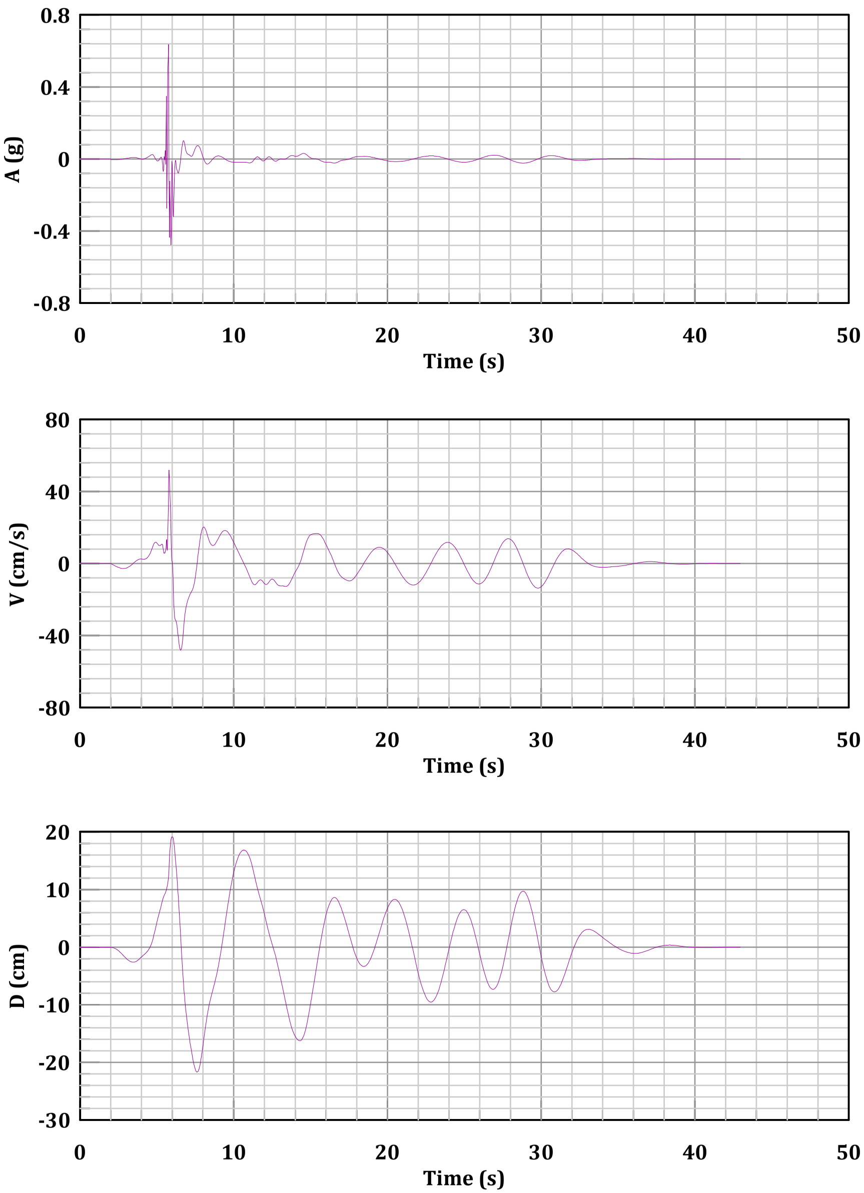


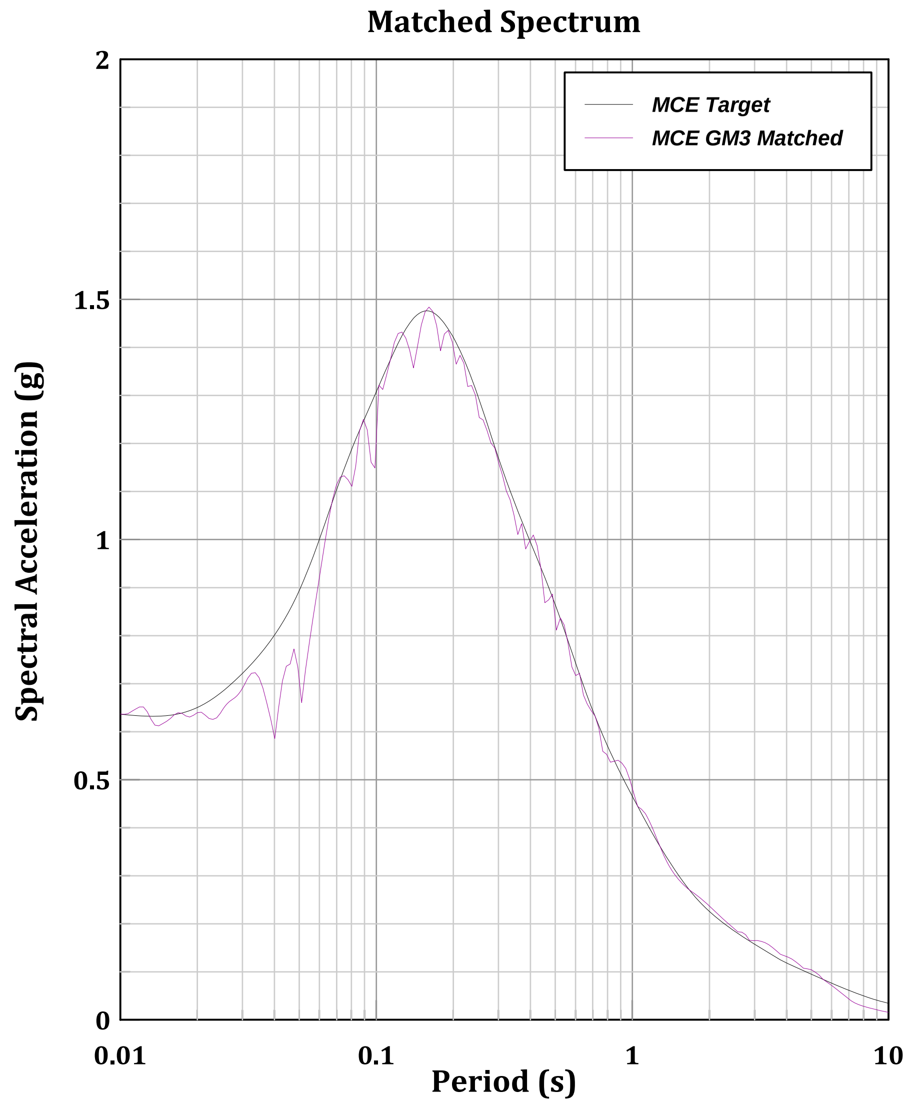


GM2 - Northridge Eqk - Pacoima Dam Station, Matched

Project No.: 15030A	Project: ALASKAN TAILINGS DAM - GROUND MOTION MATCHING	Date: APR 2016	Figure 2

GeoPentech





GM3 - Northridge Eqk - Pacoima Synthetic, Matched			
Project No.: 15030A	Project: ALASKAN TAILINGS DAM - GROUND MOTION MATCHING	Date: APR 2016	Figure 3

GeoPentech

Knight Piésold CONSULTING

Appendix B

ConeTec CPT Report

PRESENTATION OF SITE INVESTIGATION RESULTS

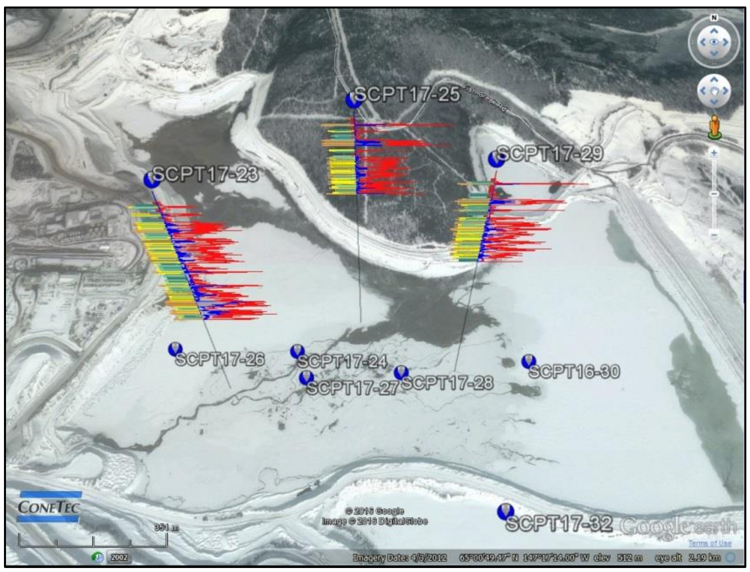
Fort Knox TSF

Prepared for:

Fairbanks Gold Mining Inc.

ConeTec Job No: 17-51001

Project Start Date: 28-Feb-2017
Project End Date: 10-Mar-2017
Report Date: 23-Mar-2017



Prepared by:

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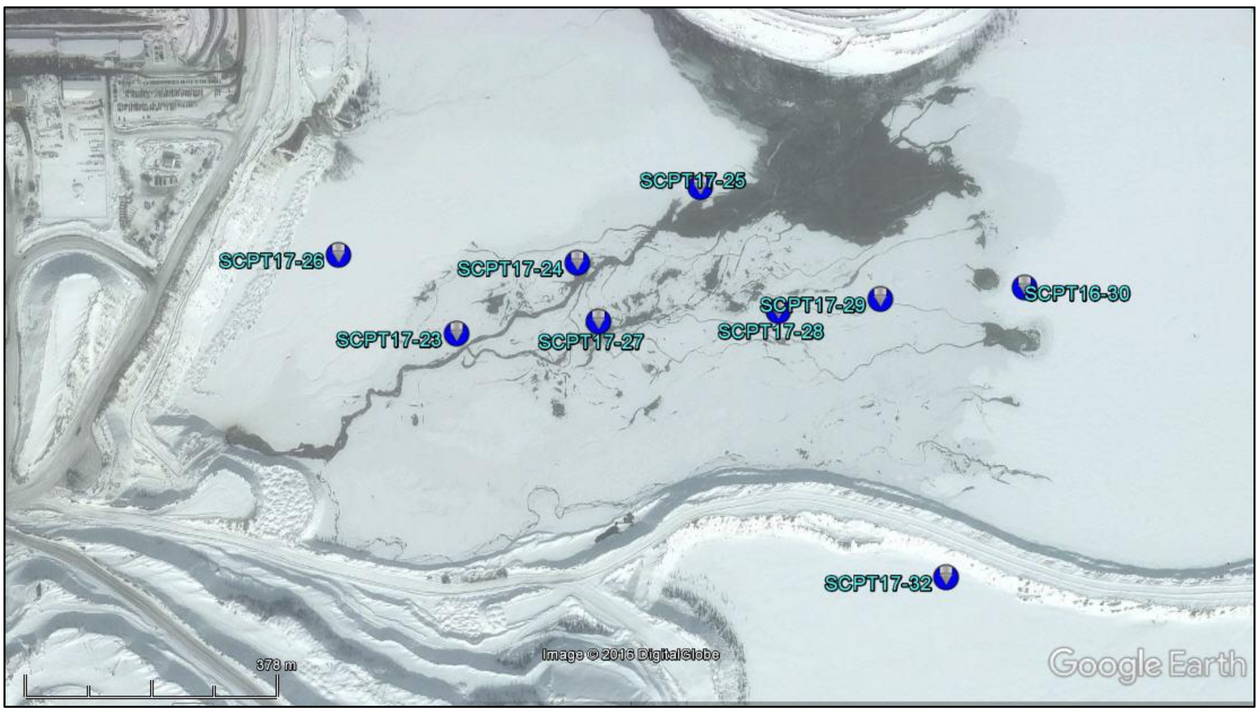
Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Investigations Ltd. for Fairbanks Gold Mining Inc. at Fort Knox TSF, Fairbanks, Alaska. The program consisted of 9 seismic cone penetration tests (SCPT).

Project Information

Project	
Client	Fairbanks Gold Mining Inc.
Project	Fort Knox TSF
ConeTec project number	17-51001

A map from Google earth including the SCPT test locations is presented below.



Rig Description	Deployment System	Test Type
Portable	Portable CPT system	SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
SCPT	Consumer-grade GPS	32606

Cone Penetration Test (CPT)	
Depth reference	Depths are referenced to the existing surface at the time of each test.
Depth recording interval	2.5 cm
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	Normalized, advanced and seismic CPT plots are included in the data release package.

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
334:T1500F15U500	334	15	225	1500	15	500
473:T1500F15U1K	473	15	225	1500	15	1K
479:T375F10U200	479	15	225	375	10	200
The CPT summary indicates the cone used for the SCPT soundings.						

Interpretation Tables	
Additional information	The Soil Behaviour Type (SBT) classification chart (Robertson et al., 1986) was used to classify the soil for this project. A detailed set of CPT interpretations were generated and are provided in Excel format files in the release folder. The CPT interpretations are based on values of corrected tip (q_t), sleeve friction (f_s) and pore pressure (u_2). Pore pressure equilibrium profiles were used for the calculated CPT parameters. Calculations for both drained and undrained parameters were included for materials that classified as silt (zone 6) and sandy silt (zone 7).

Limitations

This report has been prepared for the exclusive use of Fairbanks Gold Mining Inc. (Client) for the project titled “Fort Knox TSF”. The report’s contents may not be relied upon by any other party without the express written permission of ConeTec Investigations Ltd. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

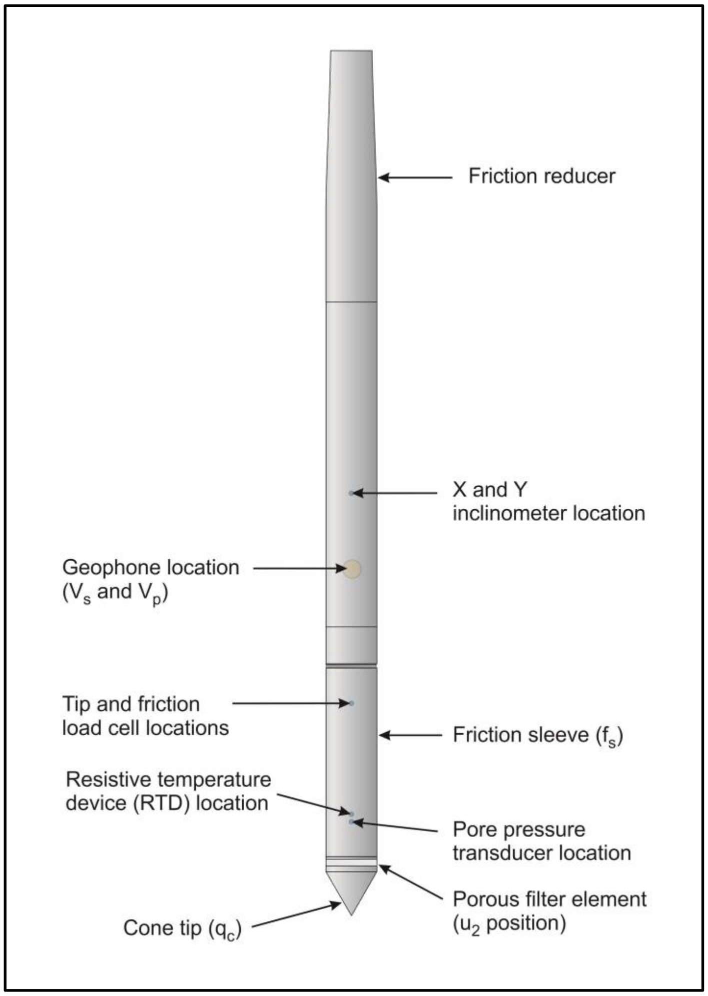


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerine or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerine under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behaviour type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (Vp) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

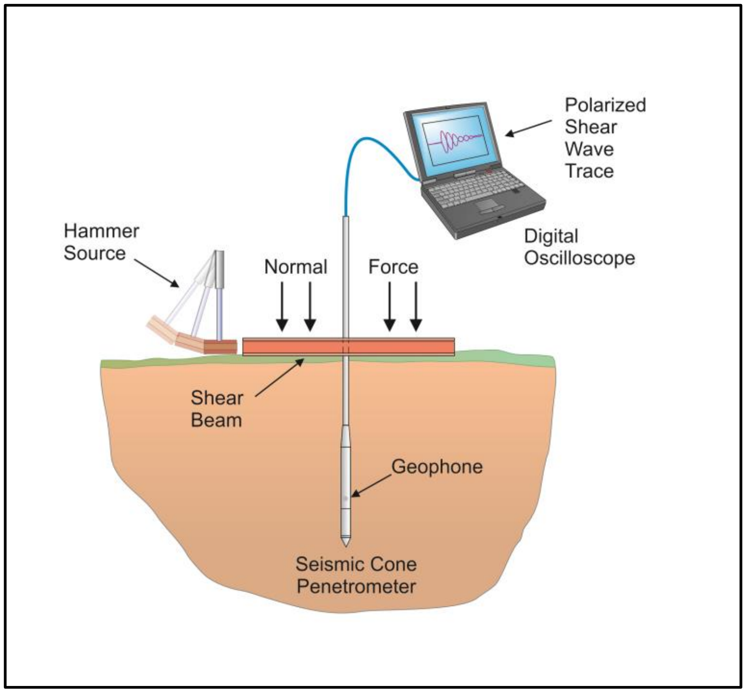


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

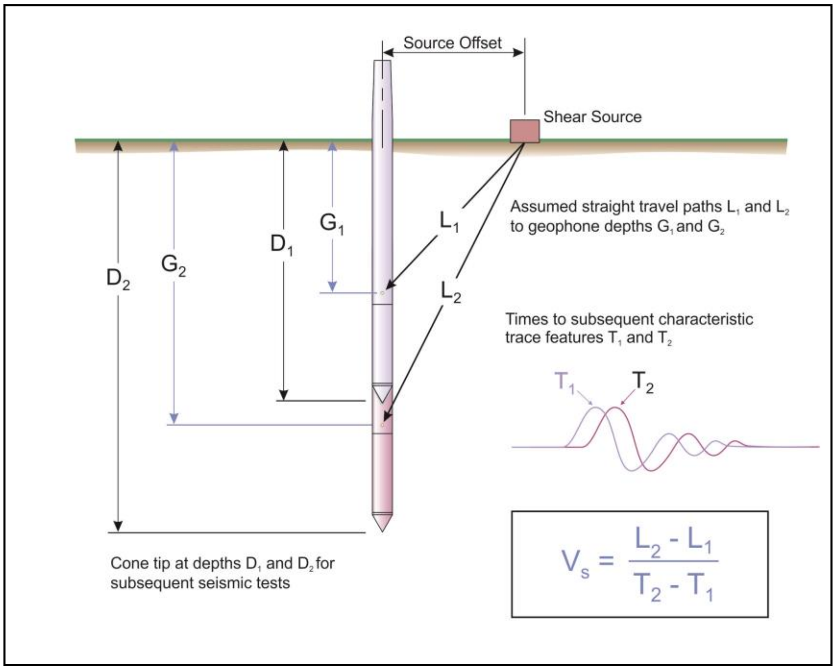


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 30 meters (V_{s30}) has been calculated and provided for all applicable soundings using an equation presented in Crow et al., 2012.

$$V_{s30} = \frac{total\ thickness\ of\ all\ layers\ (30m)}{\sum(layer\ traveltimes)}$$

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

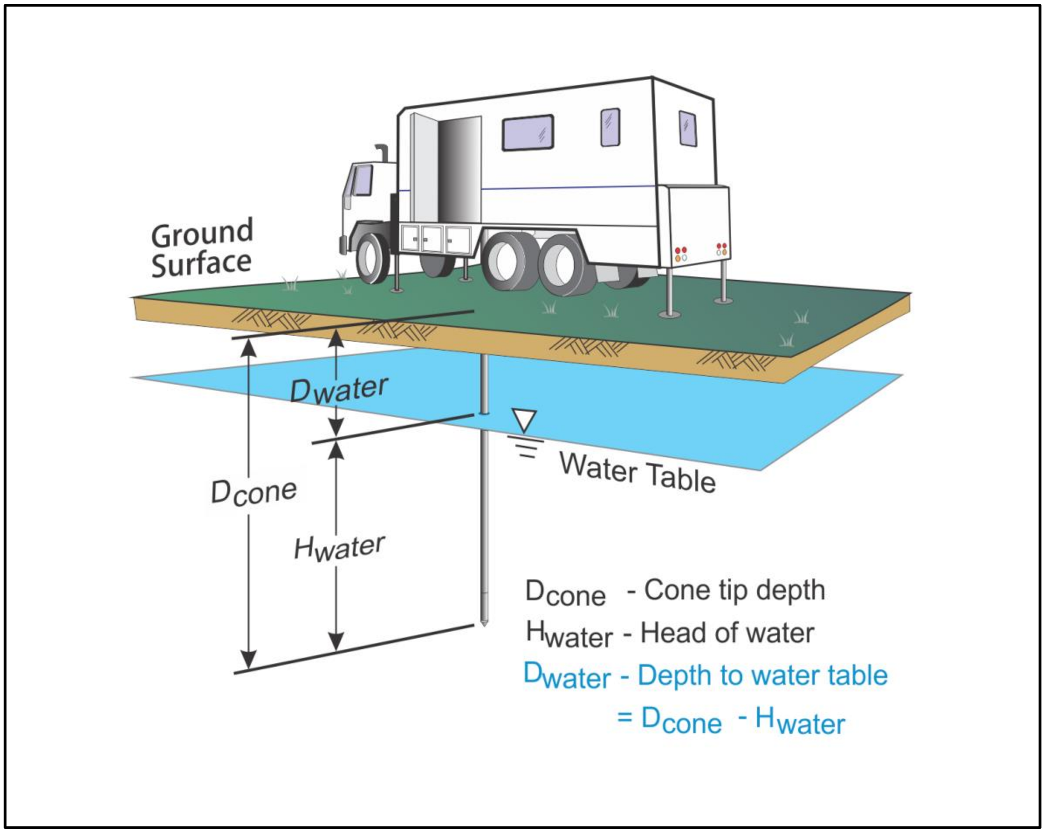


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behaviour.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

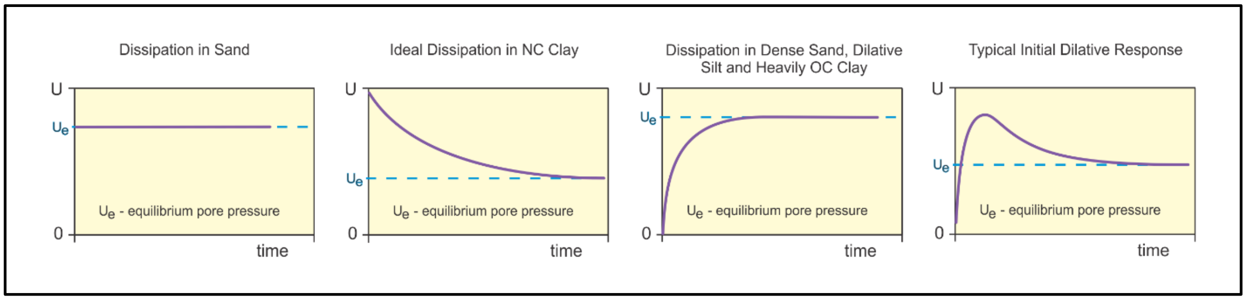


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

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Crow, H.L., Hunter, J.A., Bobrowsky, P.T., 2012, "National shear wave measurement guidelines for Canadian seismic site assessment", GeoManitoba 2012, Sept 30 to Oct 2, Winnipeg, Manitoba.

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Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, “An analytical study of the cone penetration test in clay”, Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Cone Penetration Test Alternate Range Plots
- Cone Penetration Test Single Page Plots
- Cone Penetration Test Normalized Plots
- Cone Penetration Test Advanced Plots with Phi Angle, Undrained Shear Strength (Su-Nkt) and N1(60)
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and
Standard Cone Penetration Test Plots

Job No:	17-51001
Client:	Fairbanks Gold Mining Inc.
Project:	Fort Knox TSF
Start Date:	28-Feb-2017
End Date:	10-Mar-2017

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date from	Date to	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Northing[2] (m)	Easting (m)	Refer to Notation Number
SCPT17-23	17-51001_SP23	07-Mar-2017	08-Mar-2017	473:T1500F15U1K	0.0	250.161	7208450	484415	
SCPT17-24	17-51001_SP24	03-Mar-2017	03-Mar-2017	473:T1500F15U1K	0.0	170.192	7208563	484609	
SCPT17-25	17-51001_SP25	02-Mar-2017	02-Mar-2017	334:T1500F15U500	0.0	138.122	7208684	484807	
SCPT17-26	17-51001_SP26	08-Mar-2017	09-Mar-2017	473:T1500F15U1K	12.4	182.741	7208576	484223	
SCPT17-27	17-51001_SP27	07-Mar-2017	07-Mar-2017	473:T1500F15U1K	0.0	147.144	7208469	484643	
SCPT17-28	17-51001_SP28	06-Mar-2017	06-Mar-2017	473:T1500F15U1K	1.9	250.817	7208485	484932	
SCPT17-29	17-51001_SP29	04-Mar-2017	04-Mar-2017	473:T1500F15U1K	0.0	161.005	7208504	485096	
SCPT16-30	17-51001_SP30	28-Feb-2017	02-Mar-2017	479:T375F10U200	0.0	187.662	7208522	485328	
SCPT17-32	17-51001_SP32	10-Mar-2017	10-Mar-2017	473:T1500F15U1K	15.5	234.167	7208062	485197	

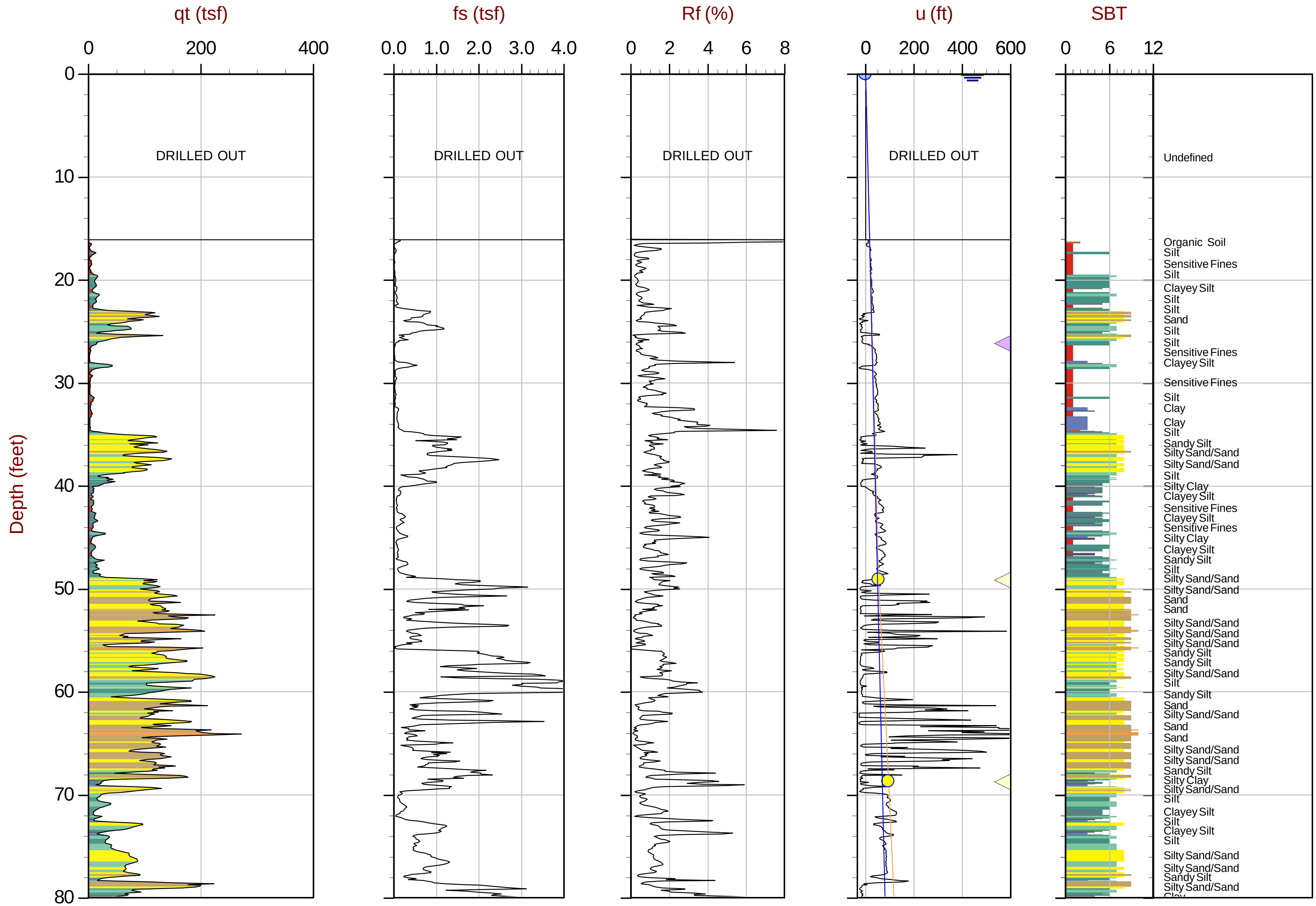
1. The assumed phreatic surface was based on pore pressure dissipation tests unless otherwise noted. Equilibrium profile was used for the calculated parameters.
2. Coordinates were collected with a consumer grade GPS device with datum WGS84/UTM Zone 6 North.

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 1 of 4

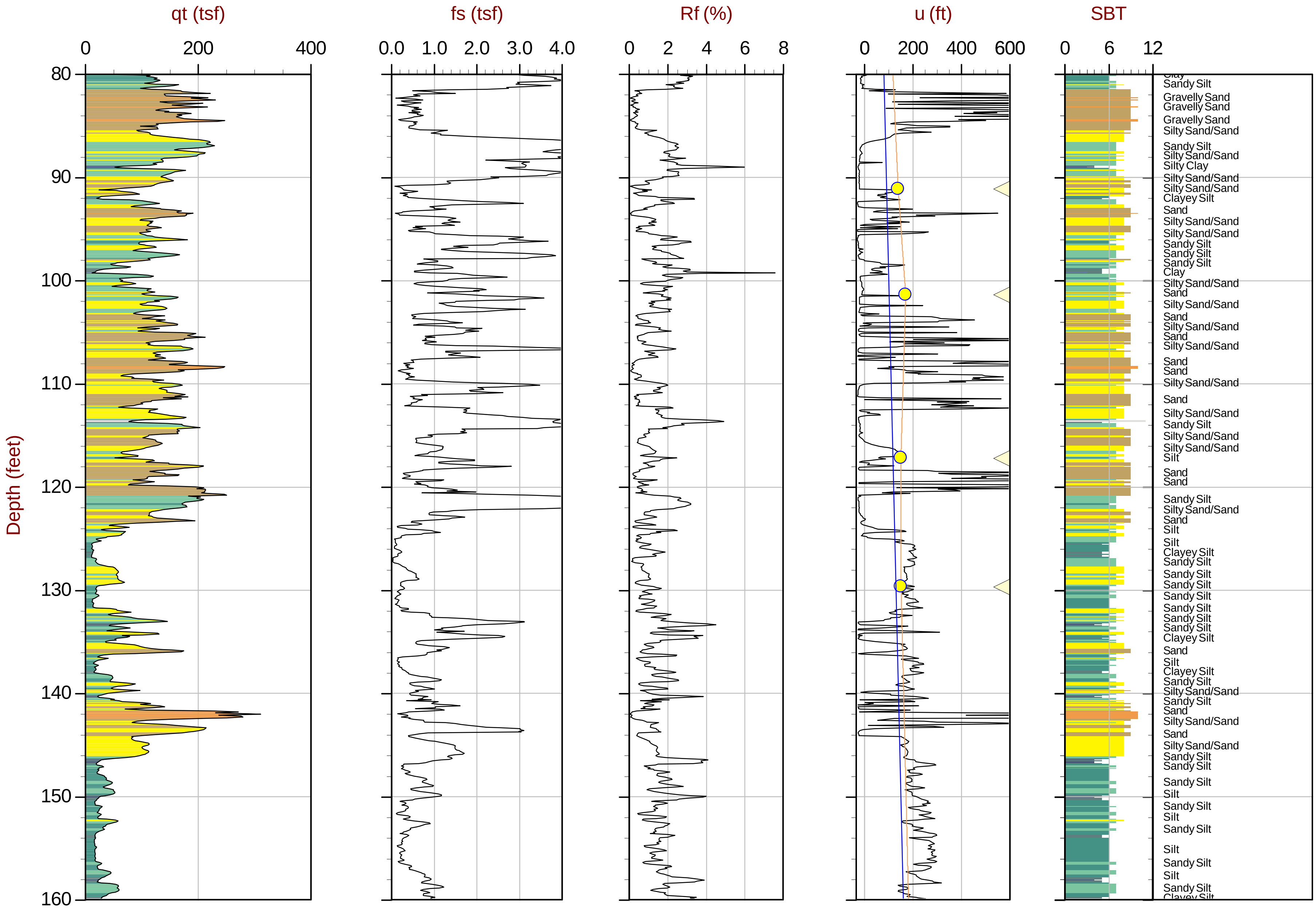
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m

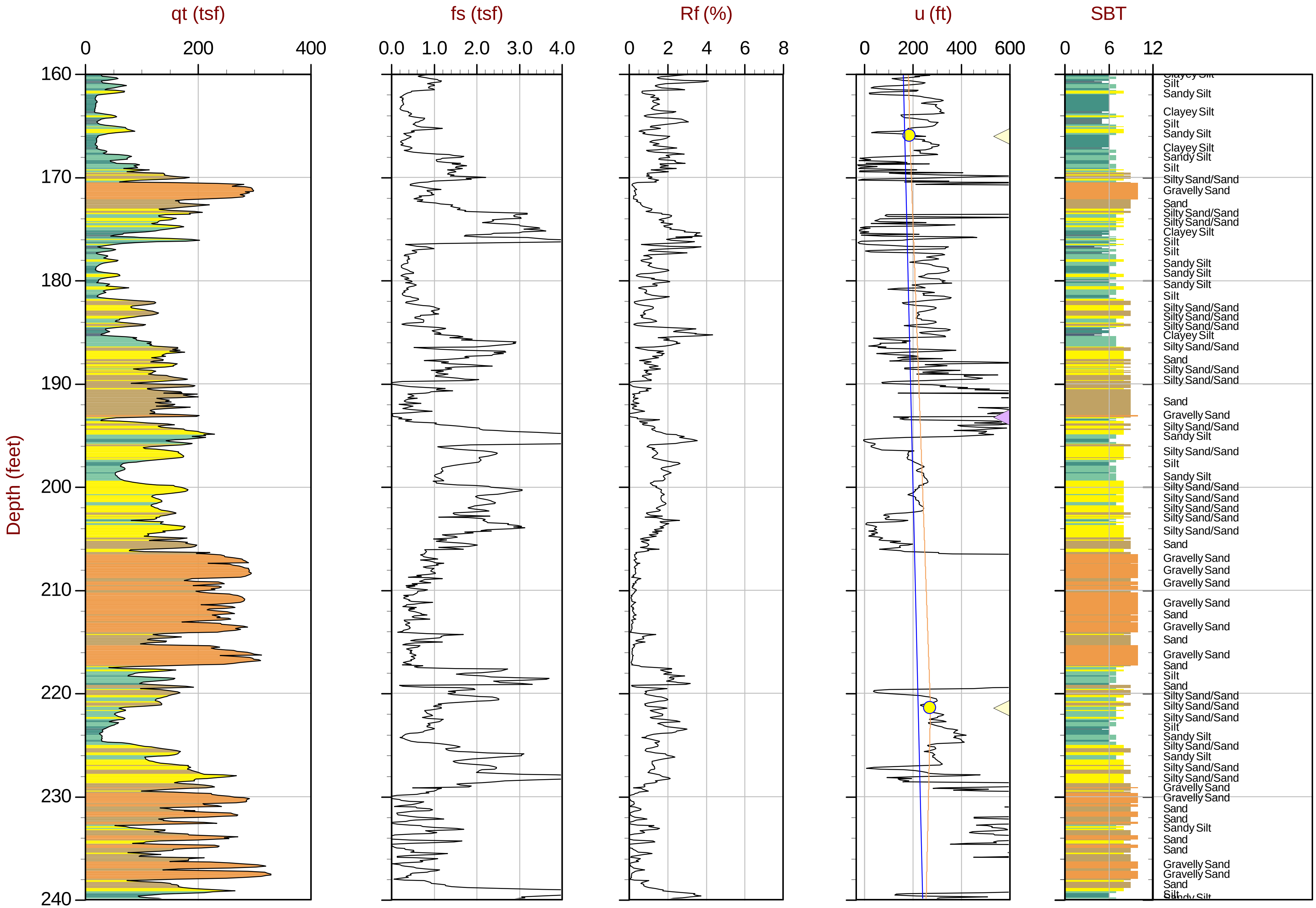
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 3 of 4

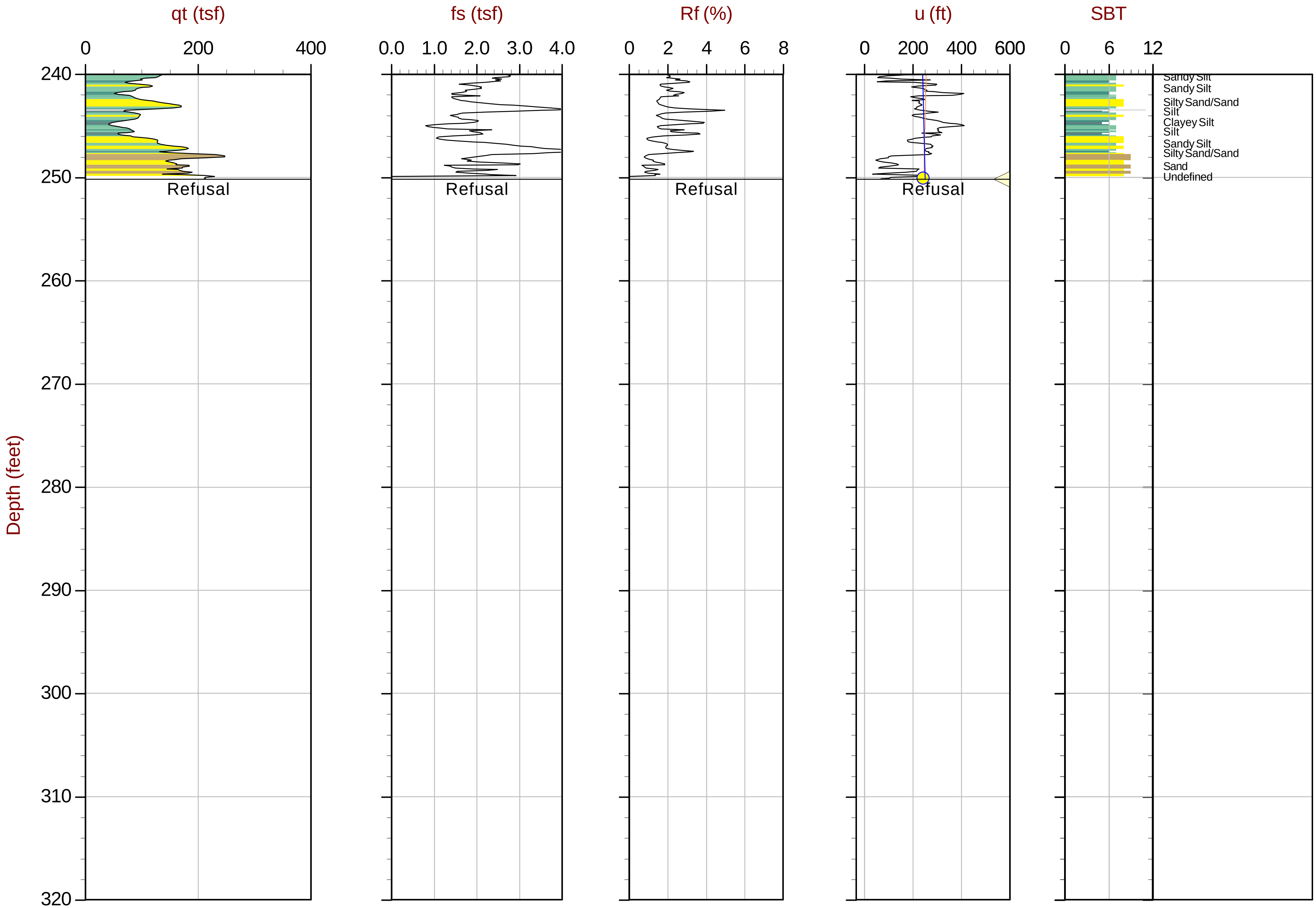
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 4 of 4

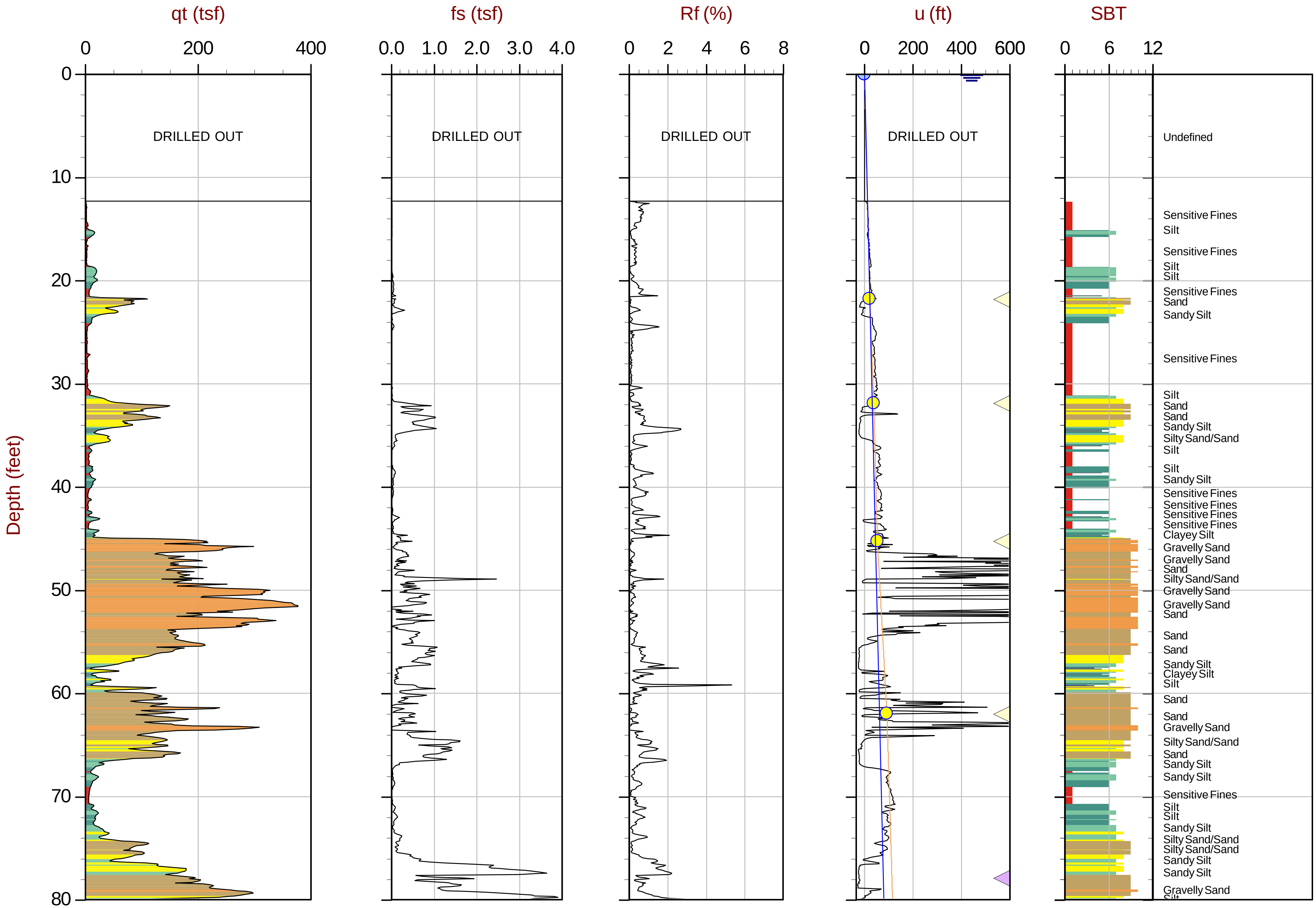
Overplot Item: Assumed Ueq, Ueq, Dissipation, equilibrium achieved, Dissipation, equilibrium not achieved, Equilibrium profile, Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 1 of 3

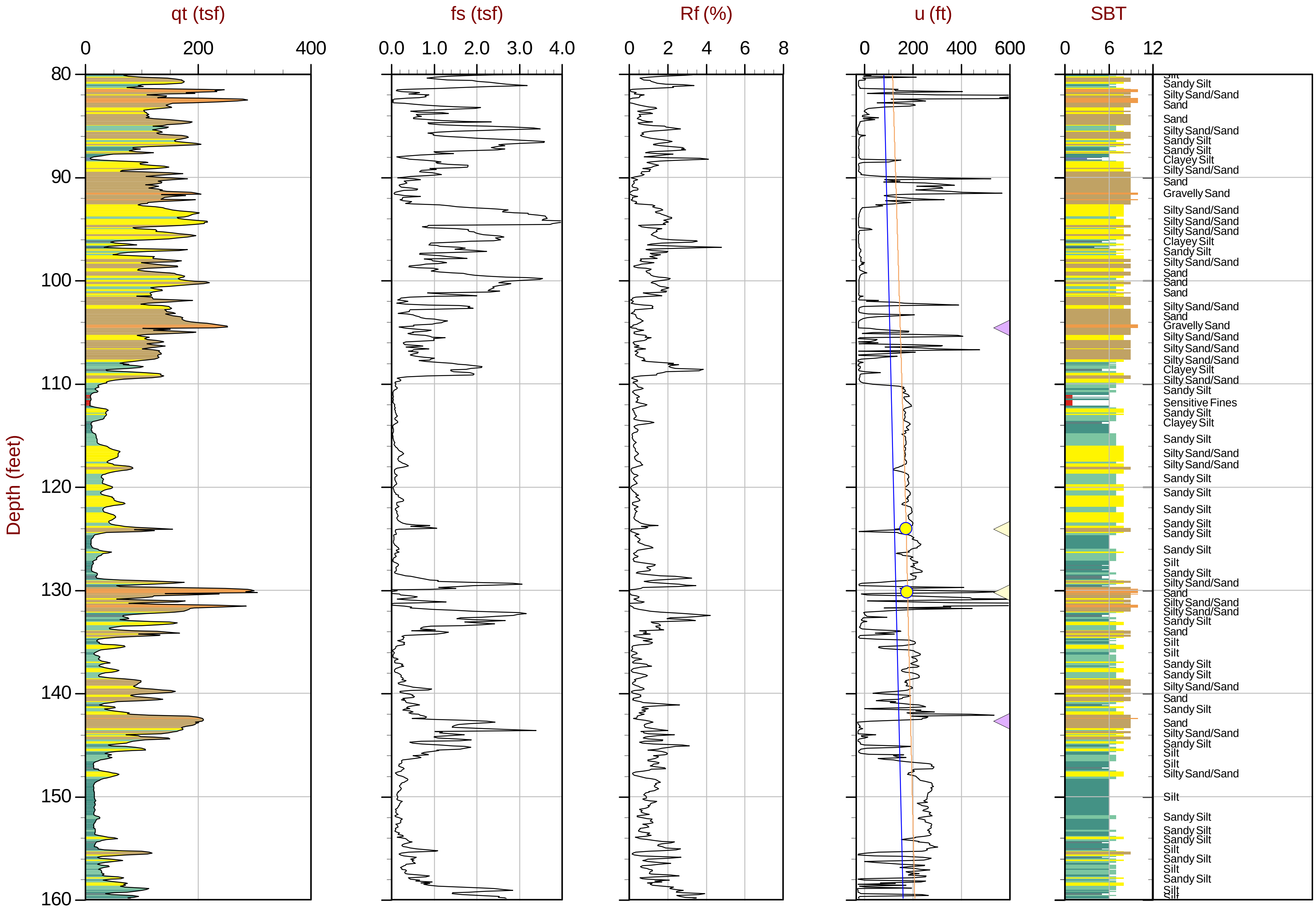
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K

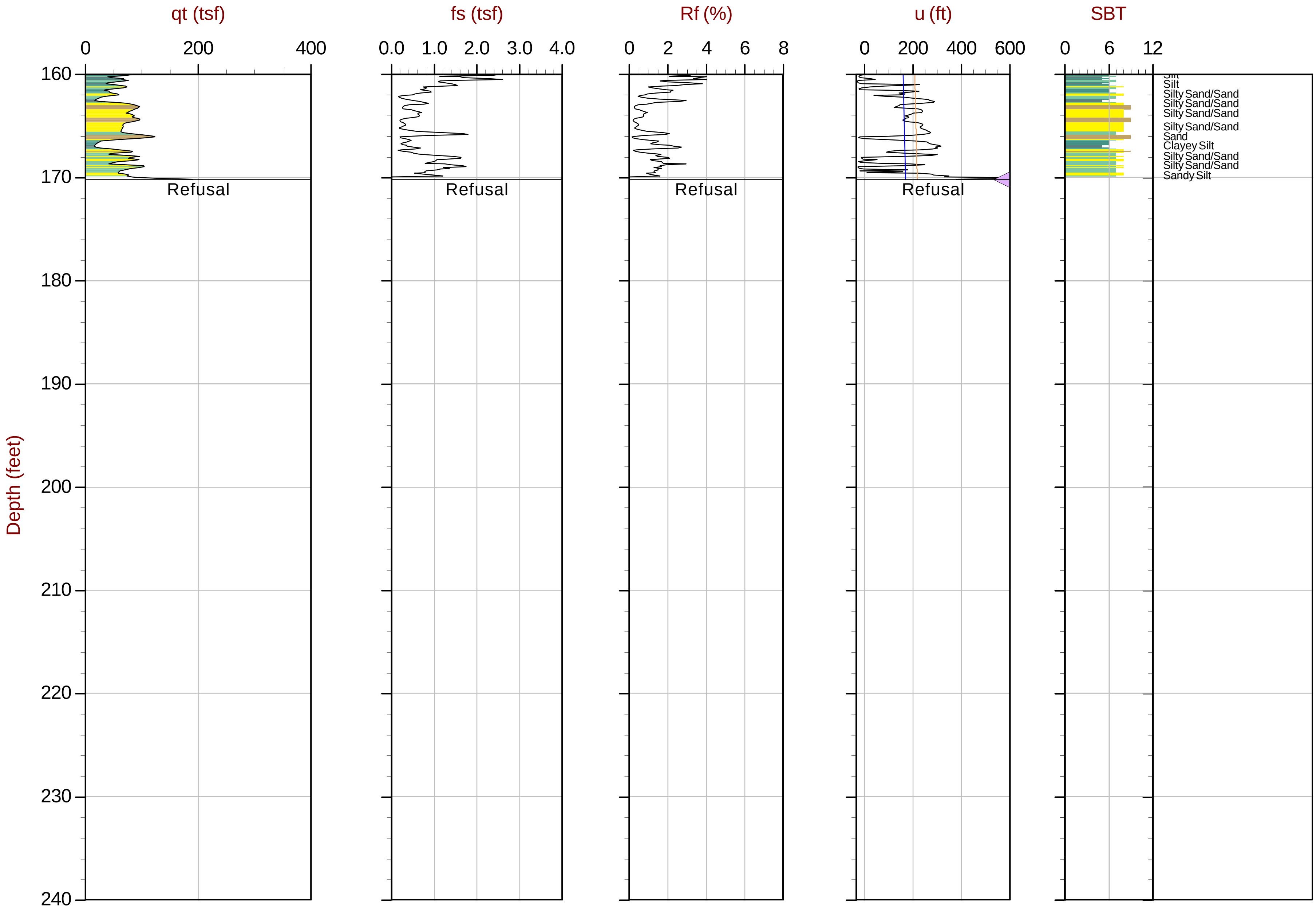


Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 2 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 3 of 3

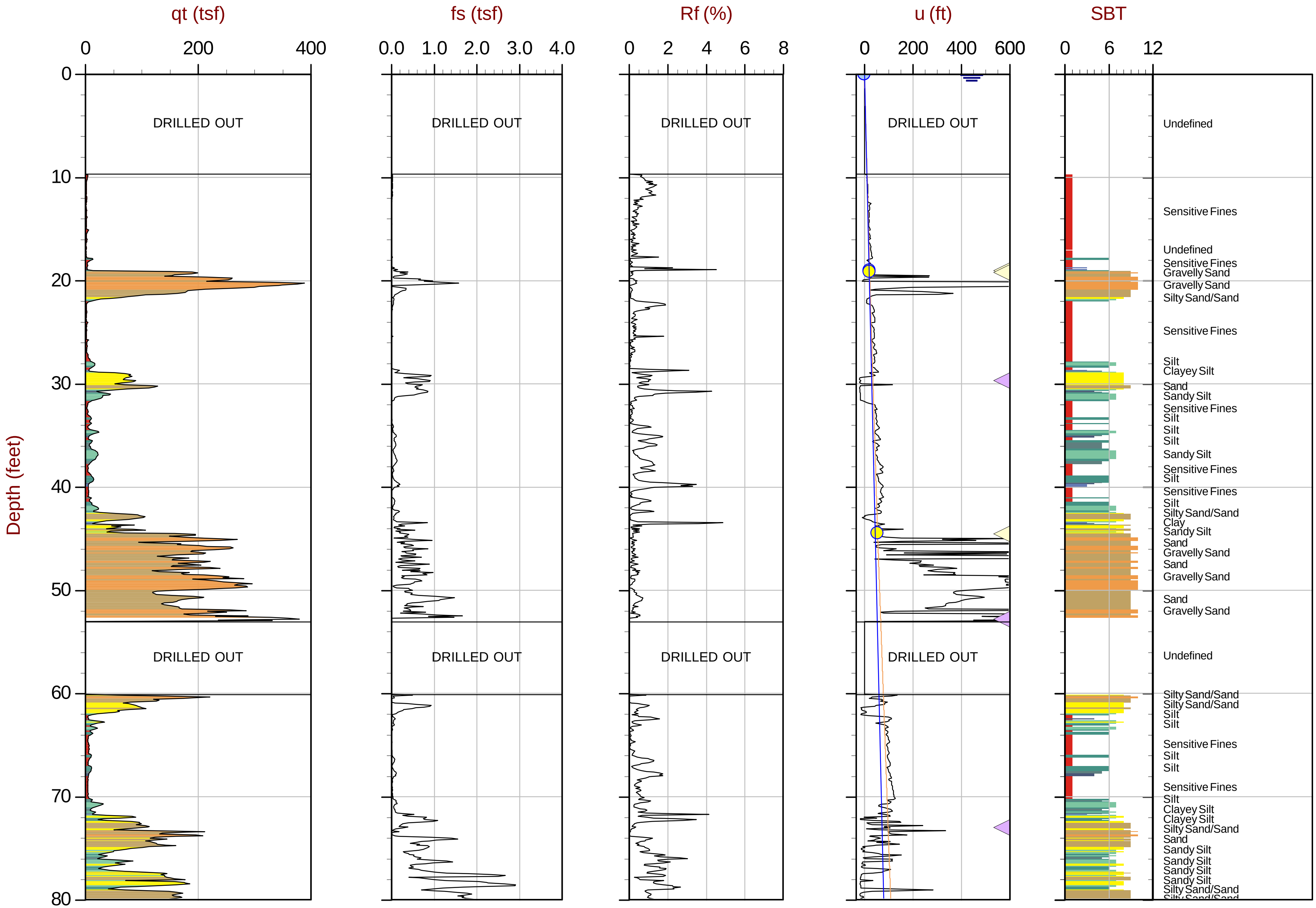
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 1 of 2

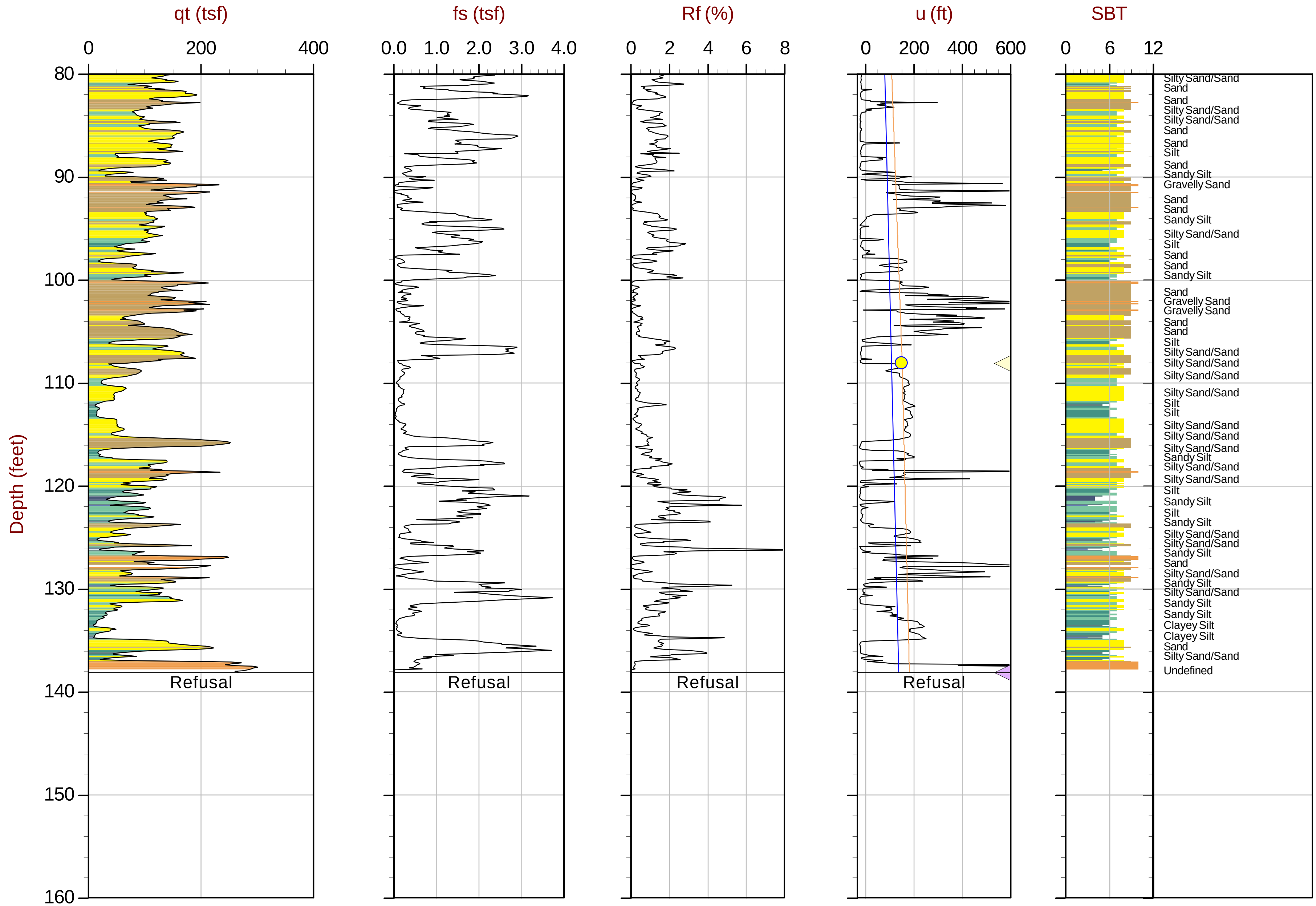
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 2 of 2

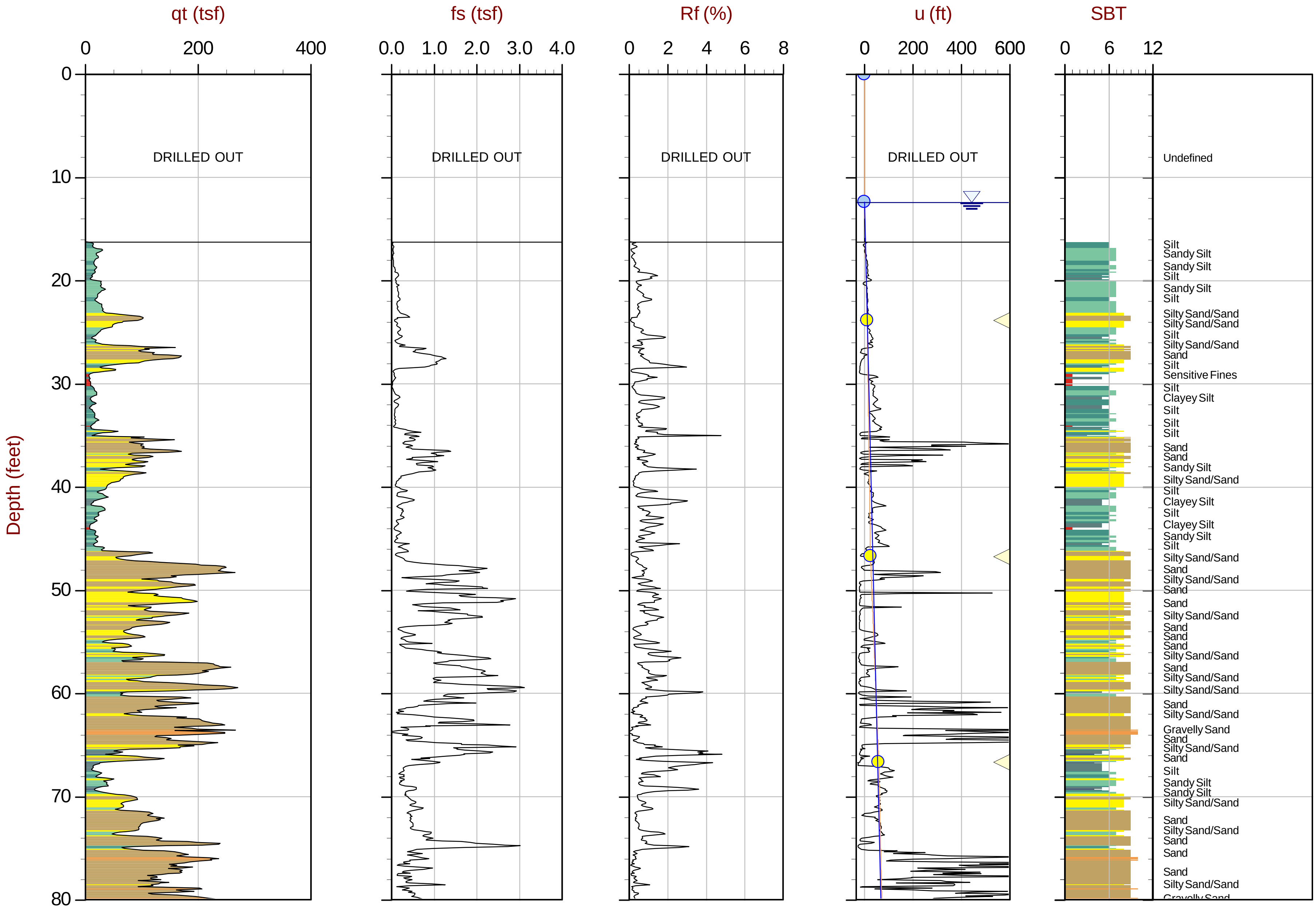
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

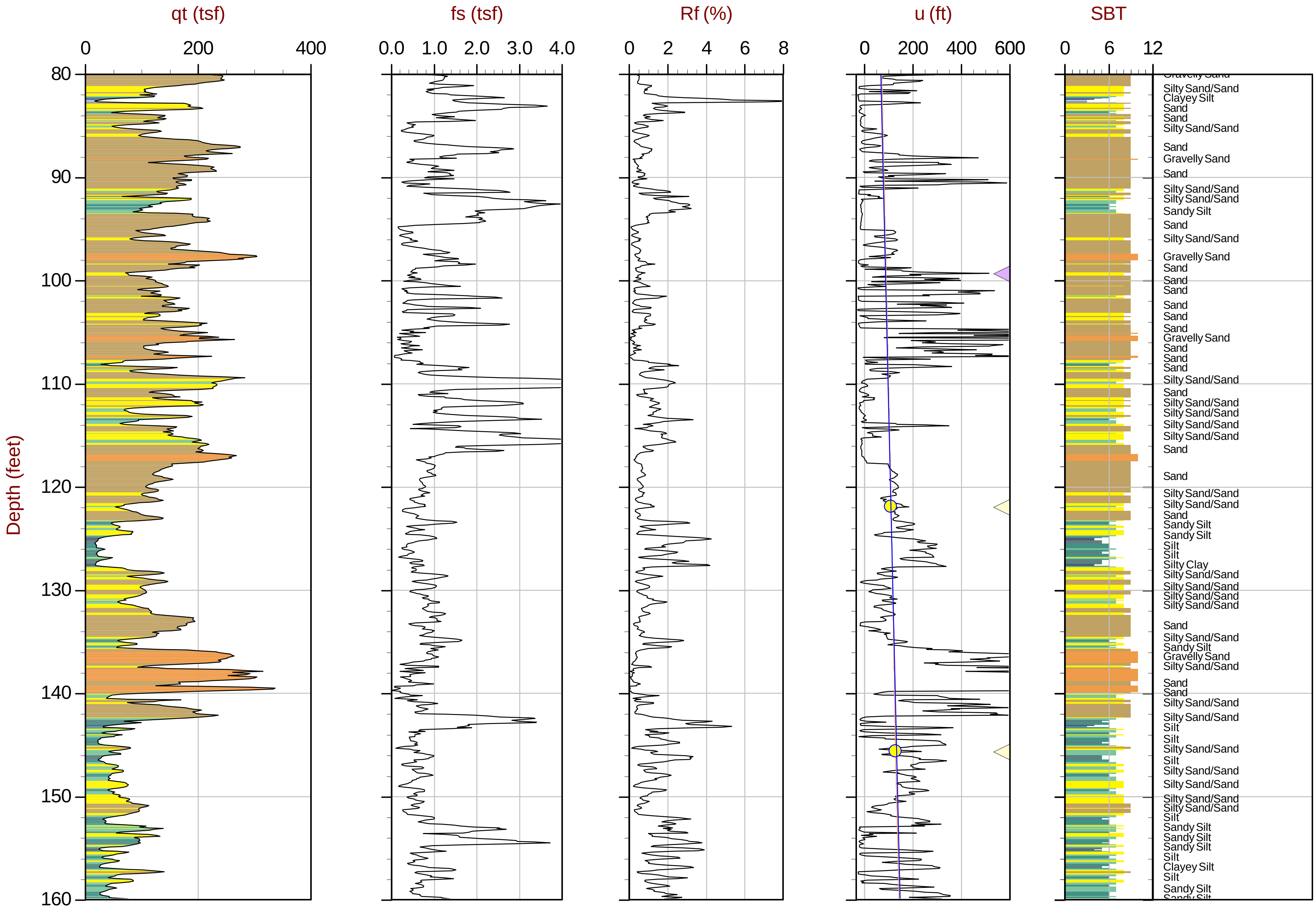
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 1 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF
Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 2 of 3

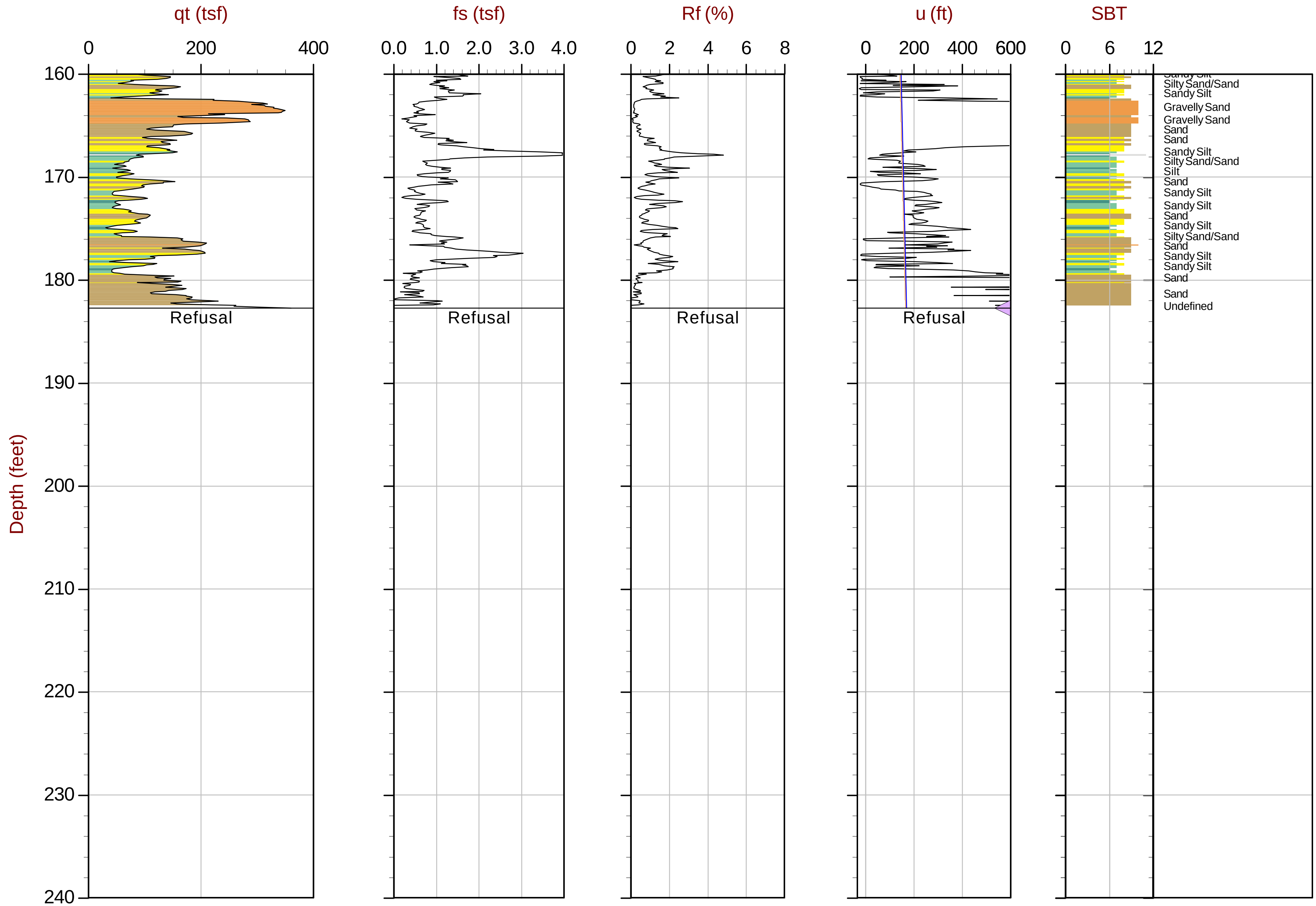
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

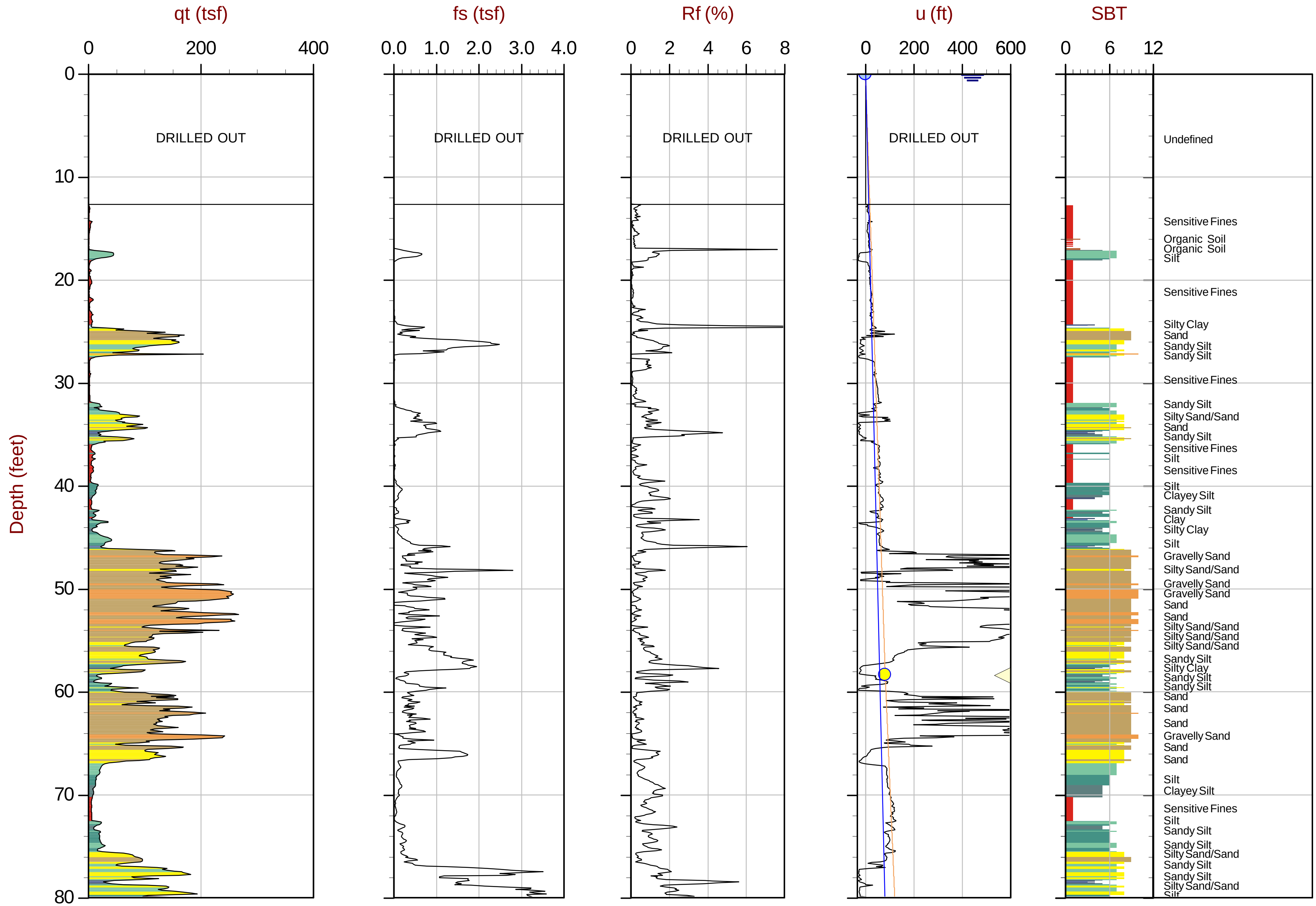
File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 3 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF
Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 1 of 2

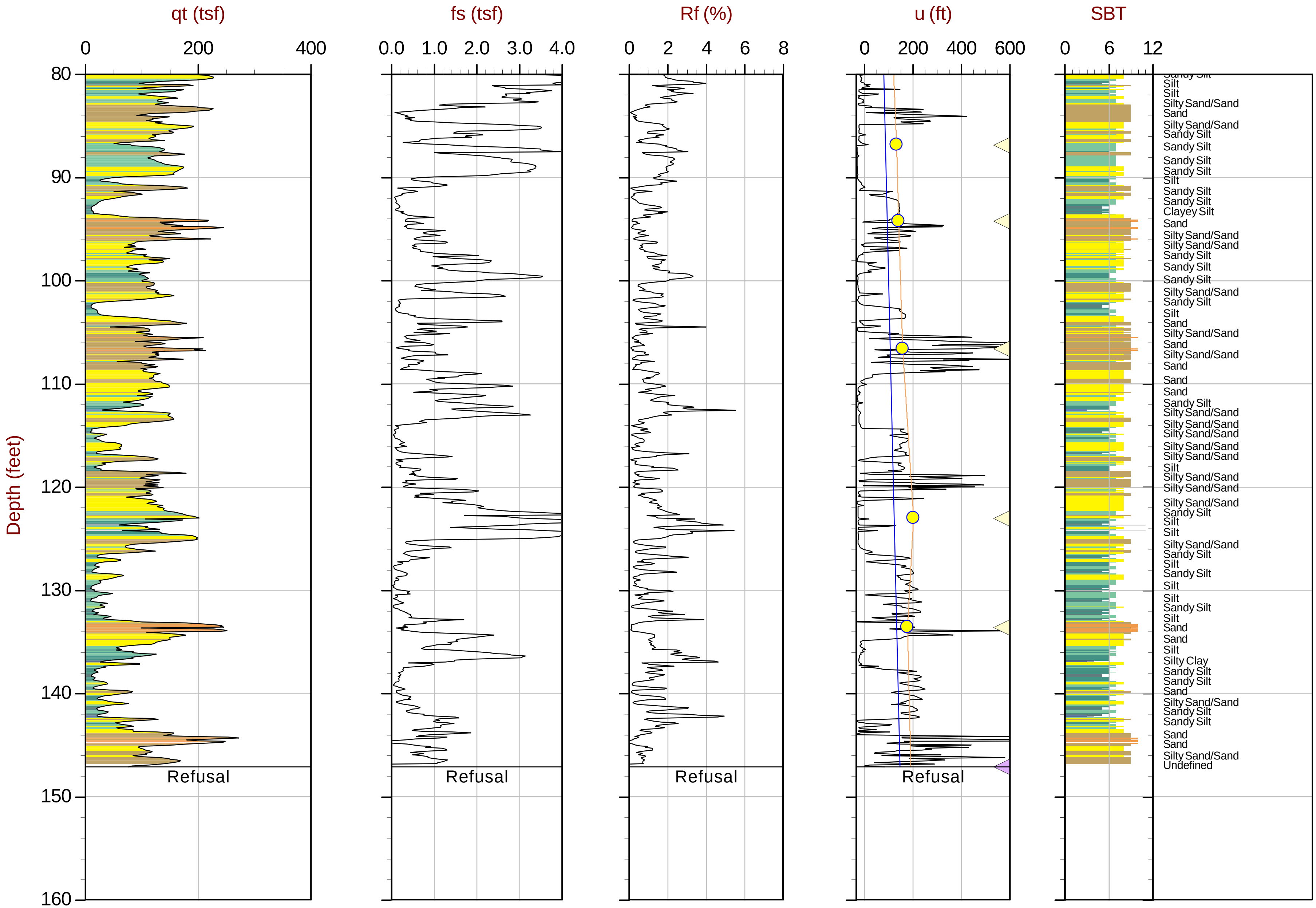
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

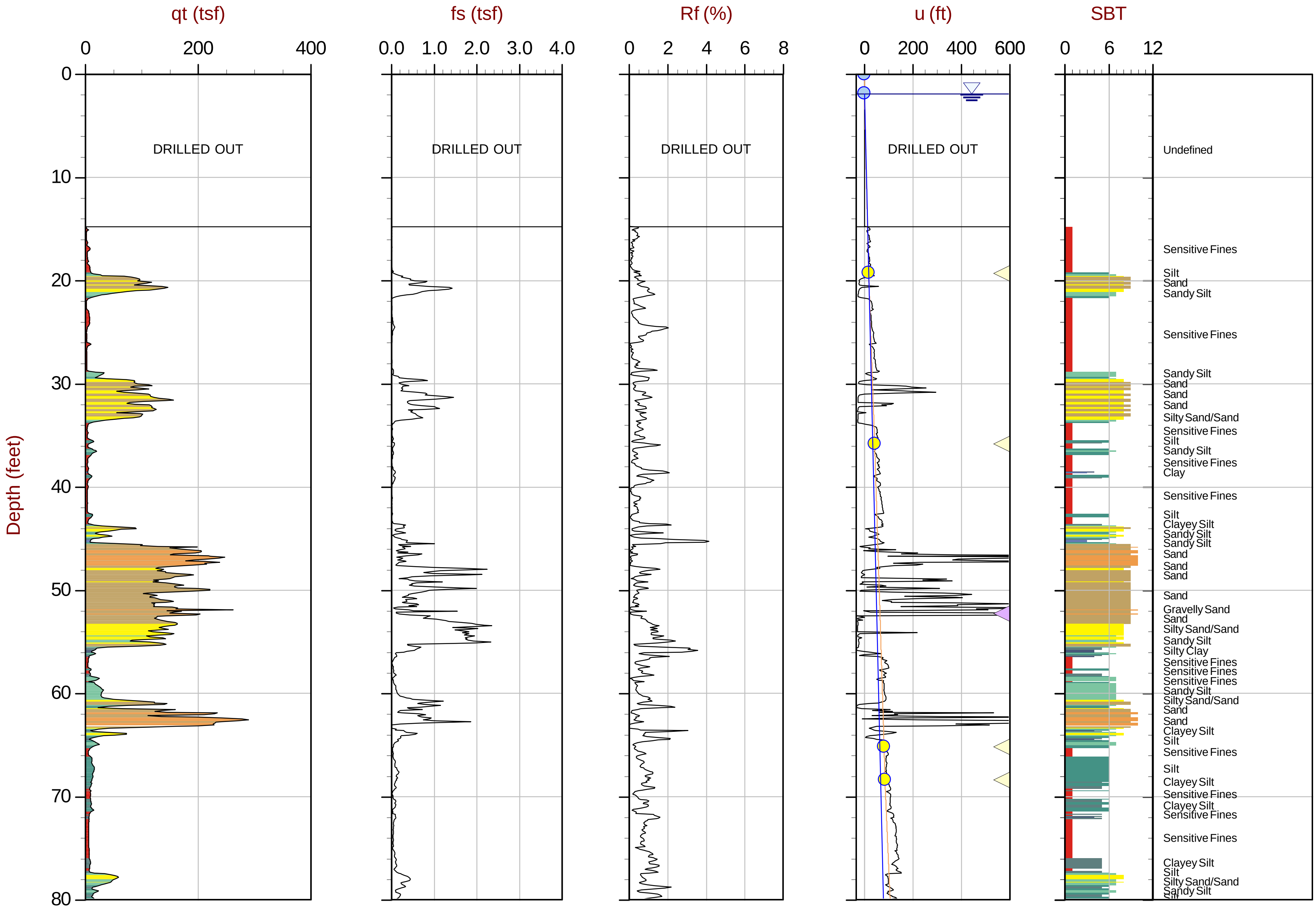
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 2 of 2

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF
Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 1 of 4

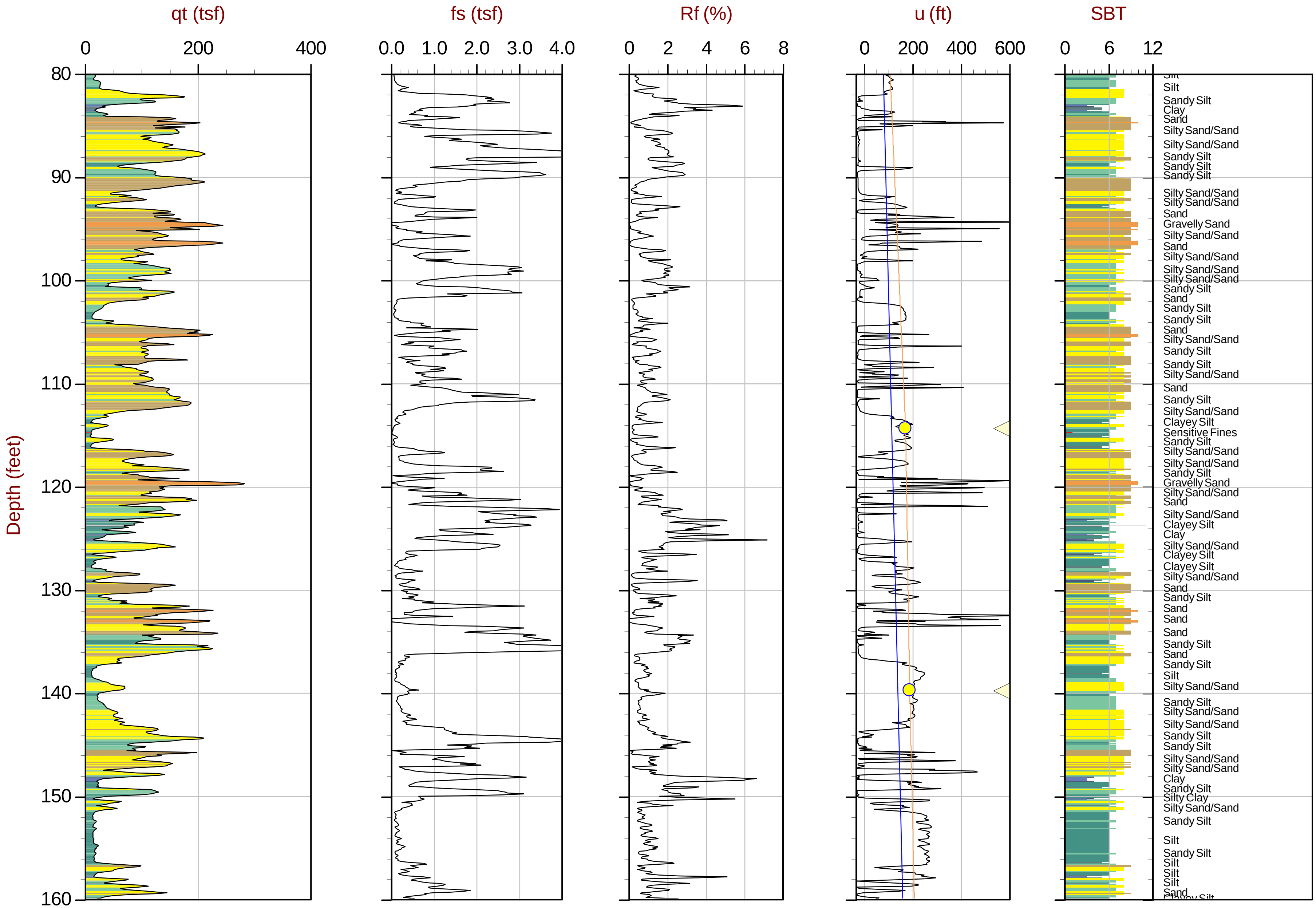
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

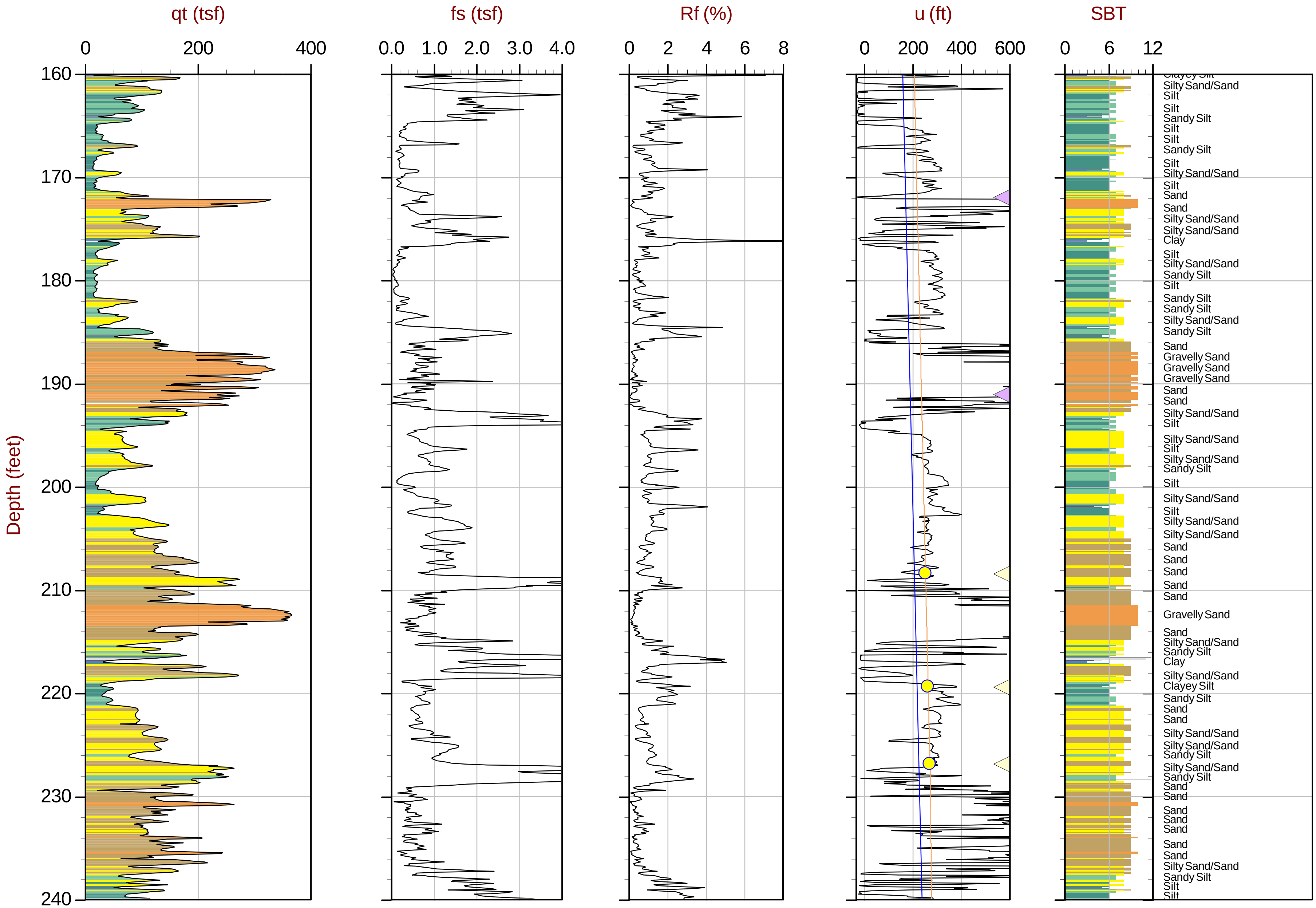
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 2 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec | *Fairbanks Gold Mining*

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 3 of 4

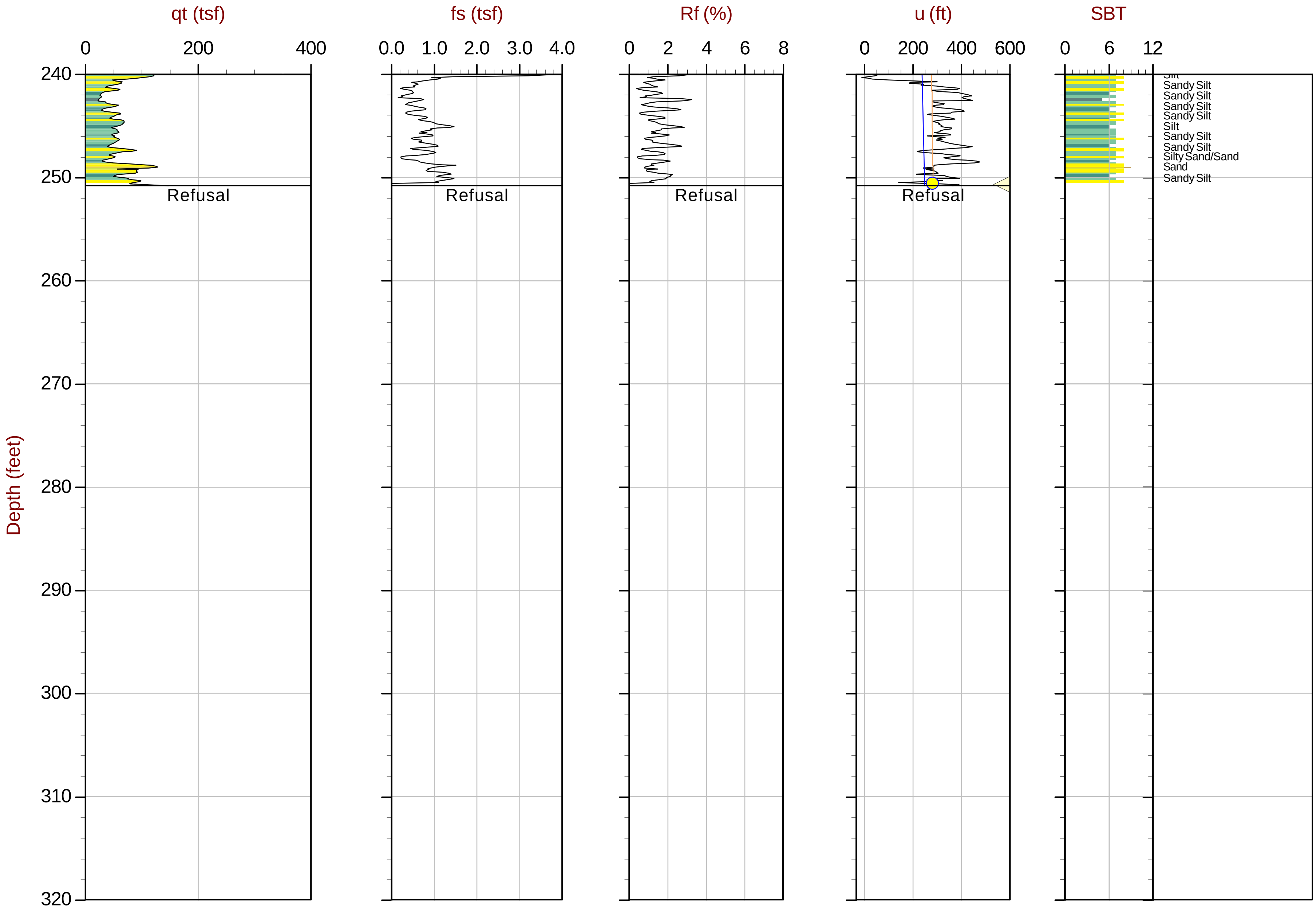
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 4 of 4

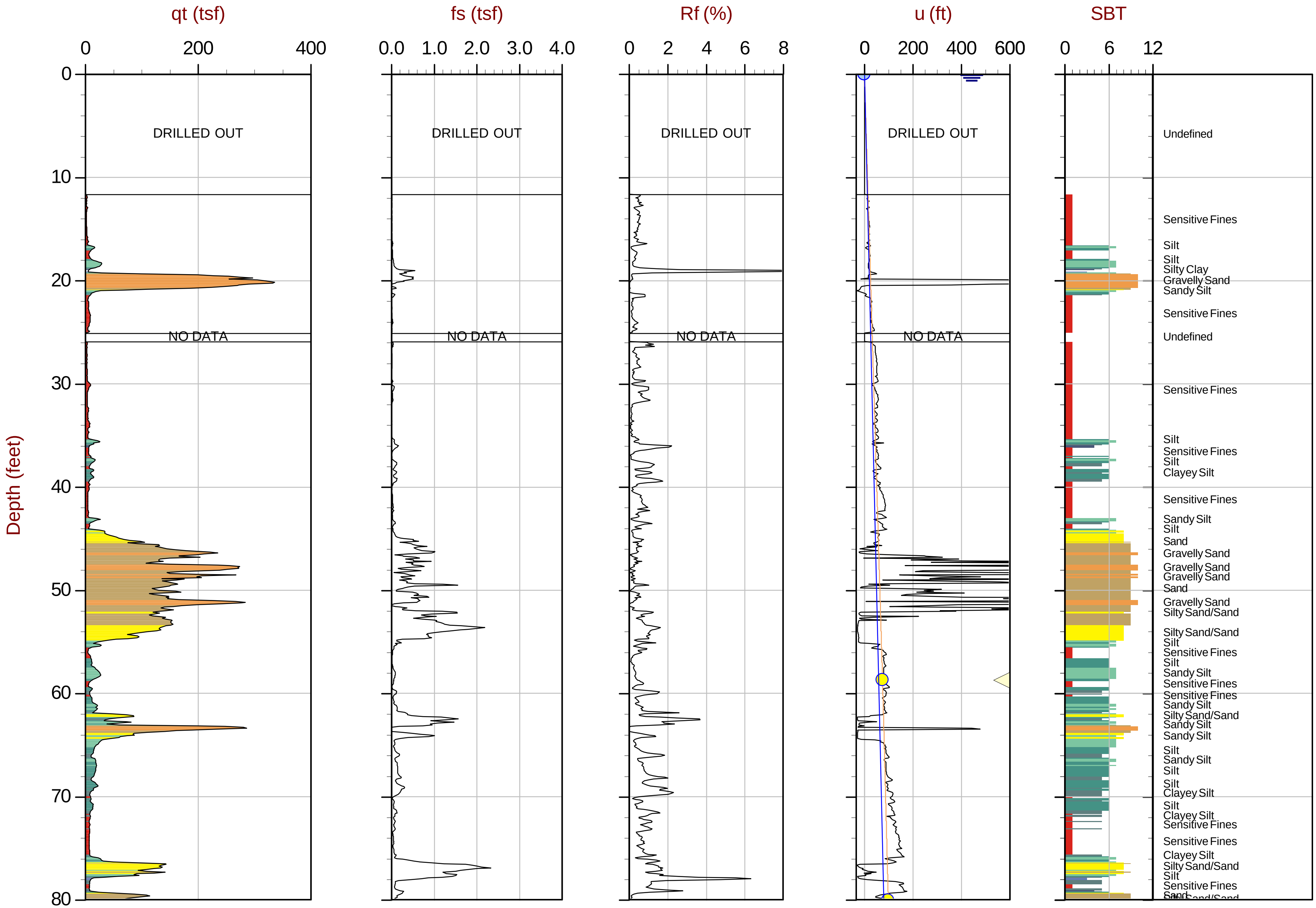
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 1 of 3

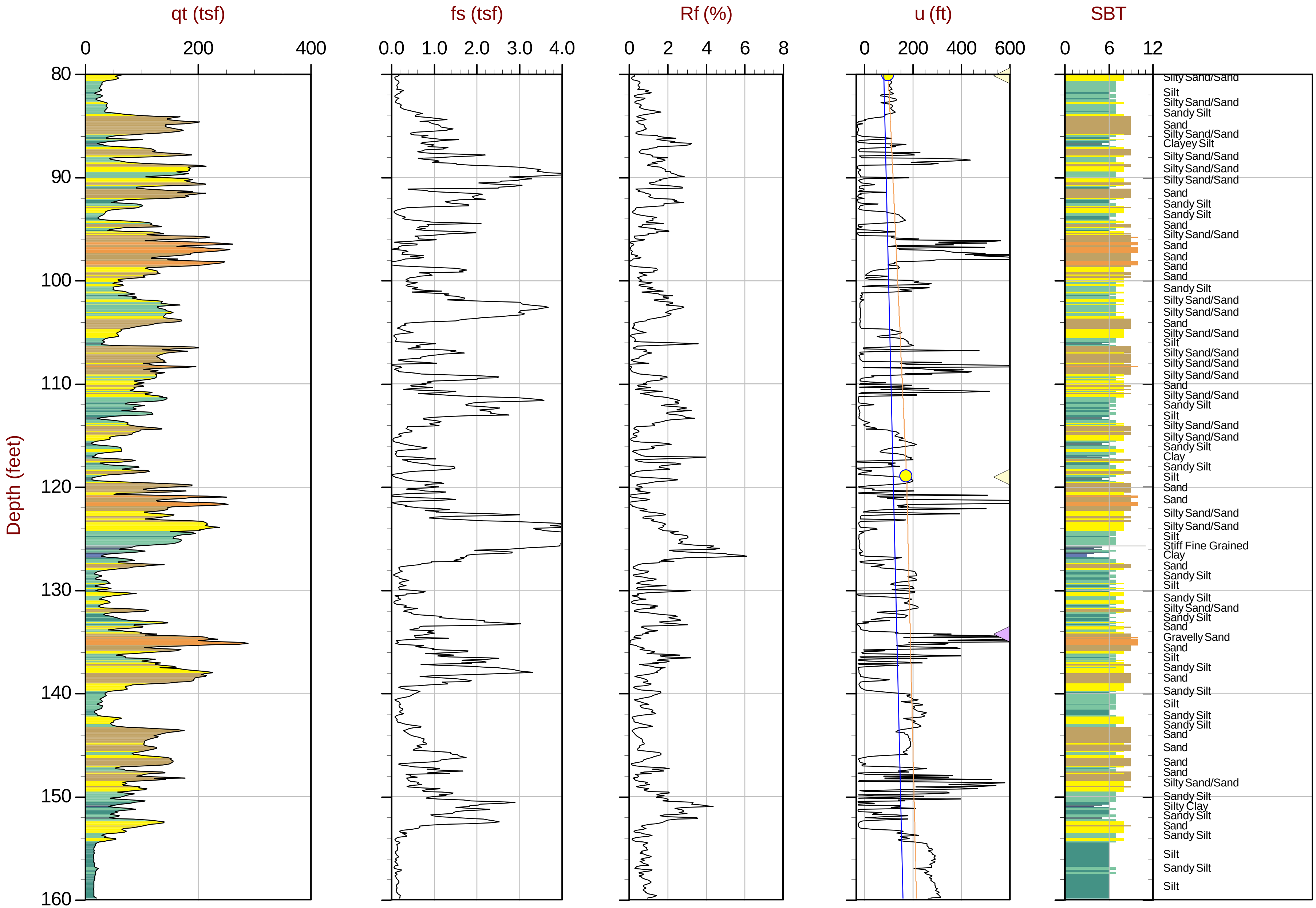
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

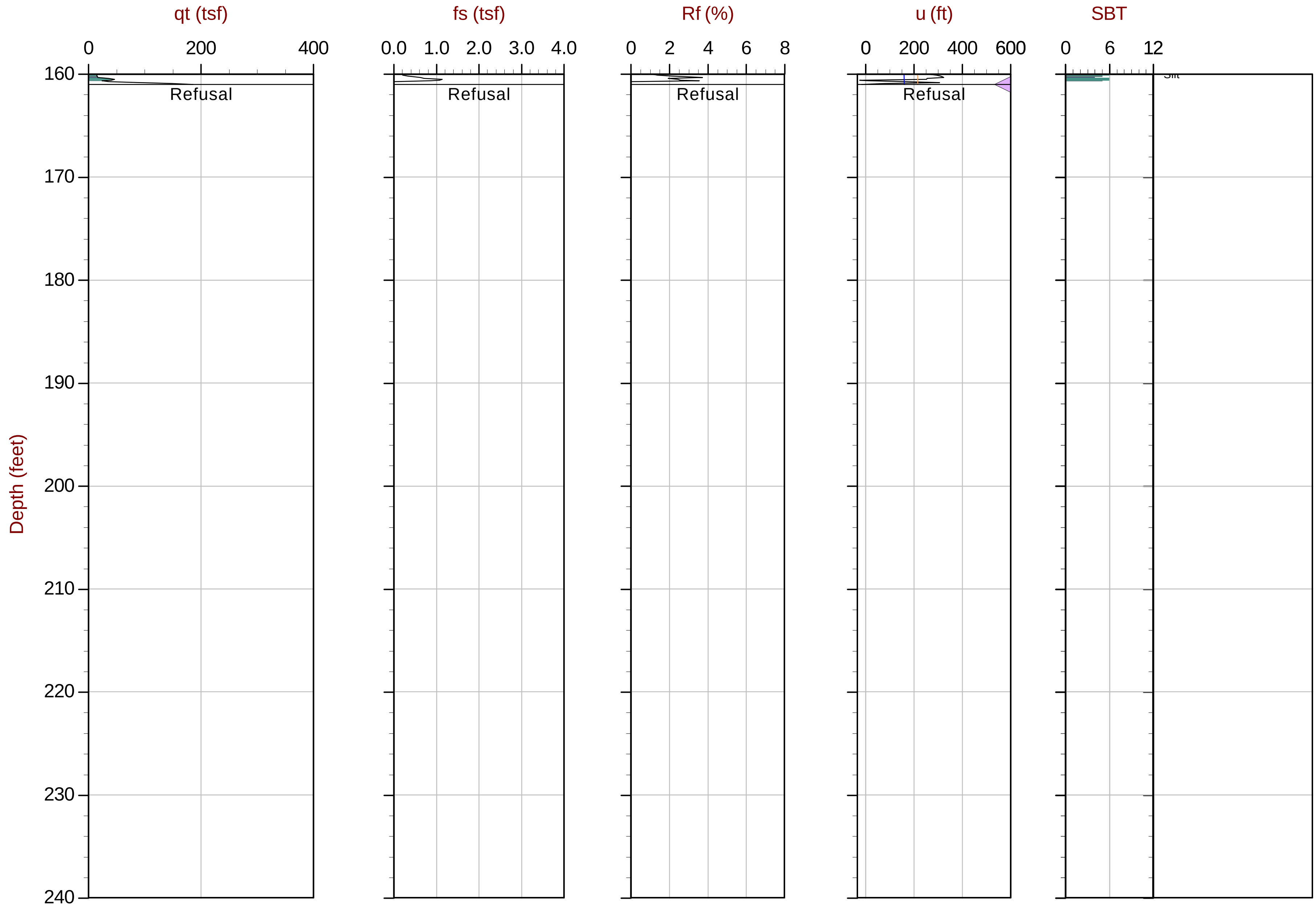
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 2 of 3

Overplot Item: Assumed Ueq | Ueq | Dissipation, equilibrium achieved | Dissipation, equilibrium not achieved | Equilibrium profile | Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 3 of 3

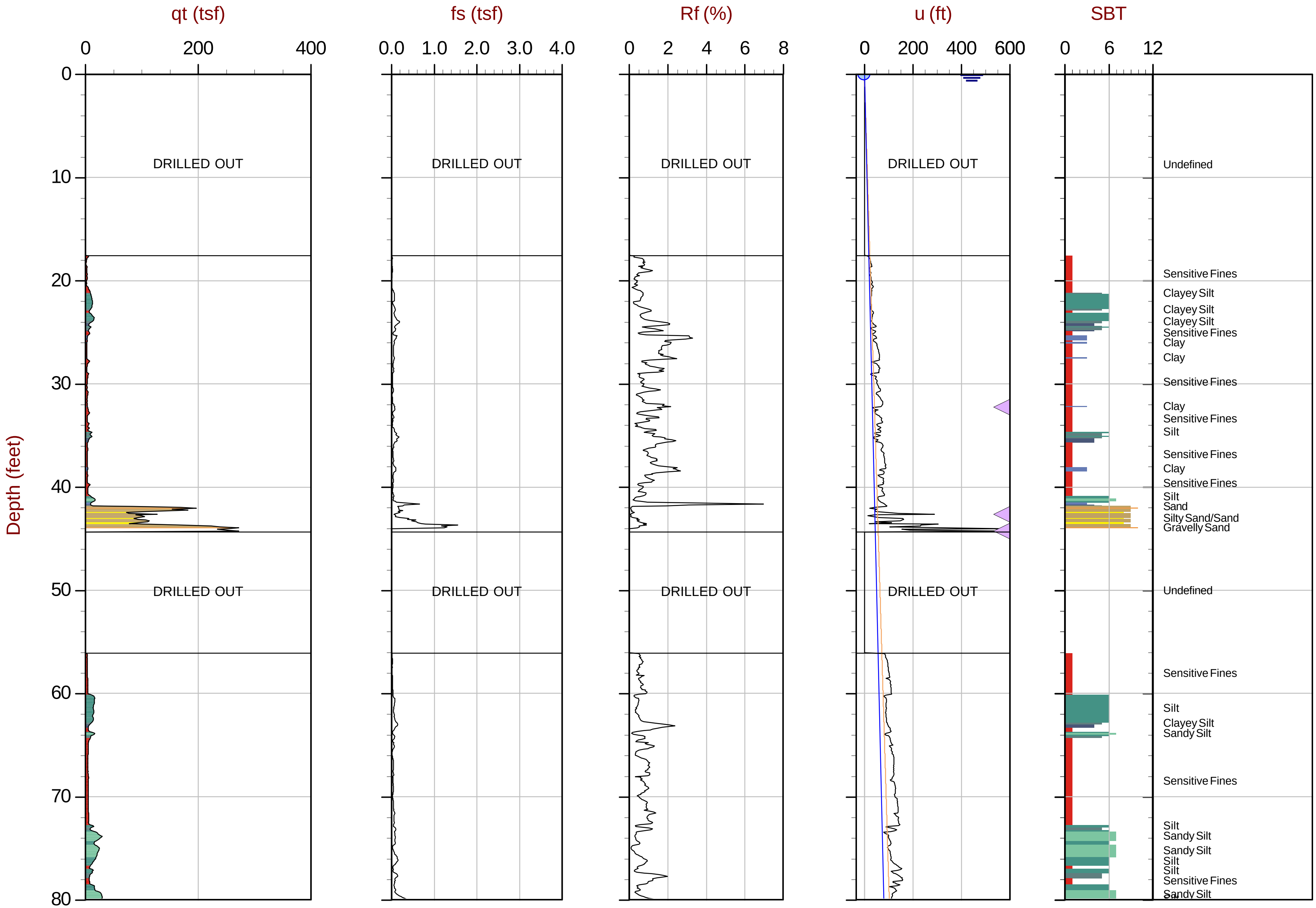
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

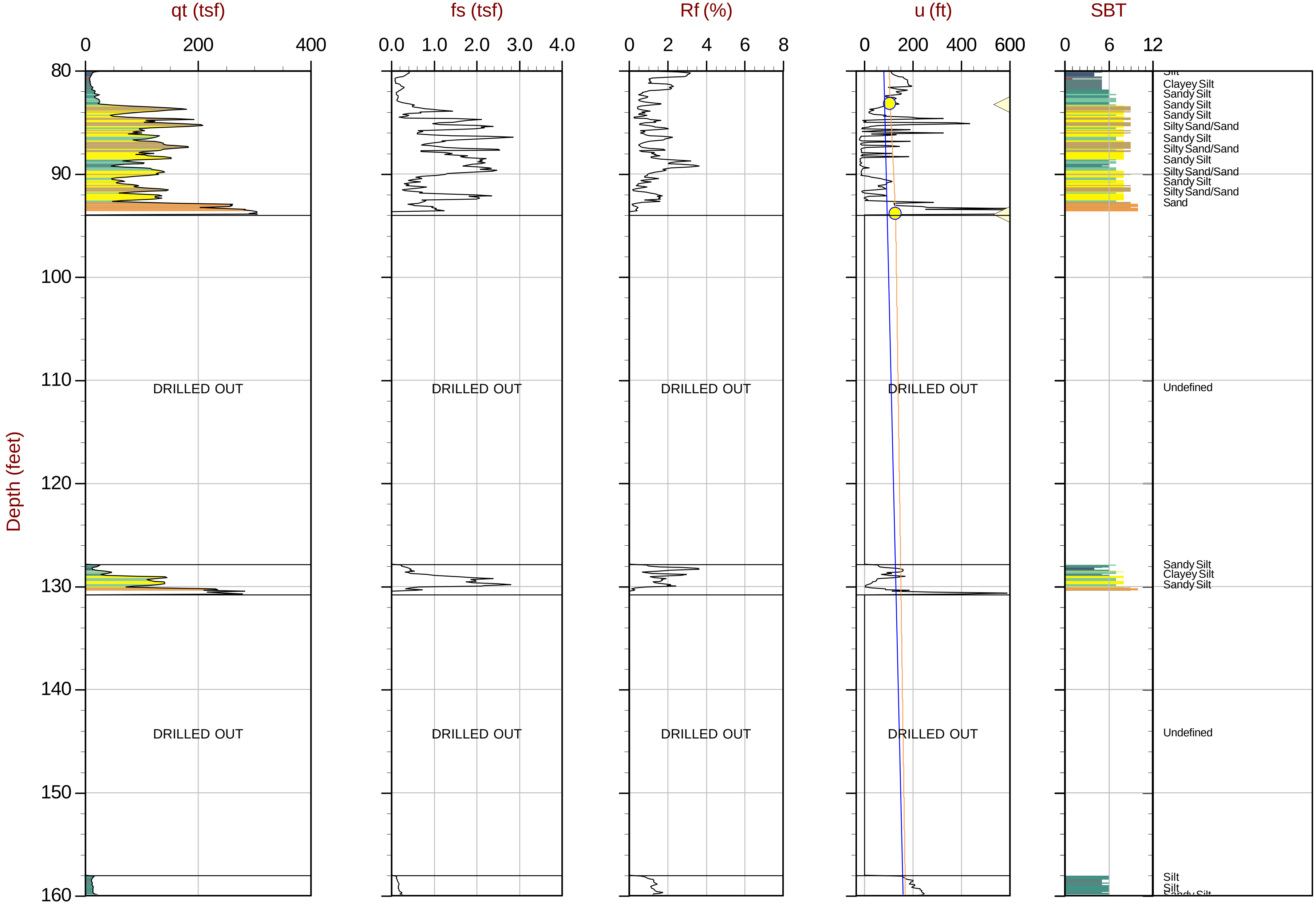
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 1 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 2 of 3

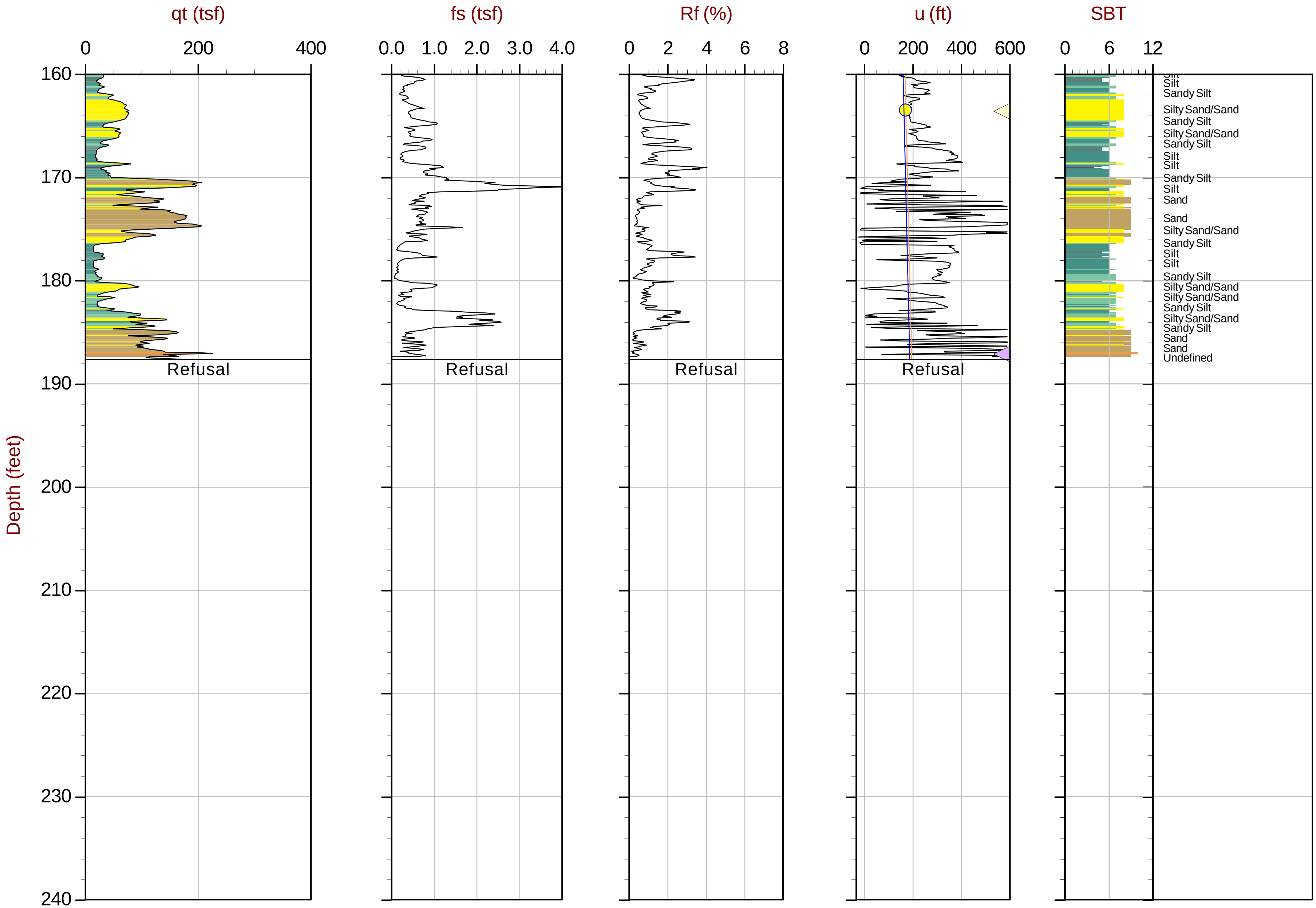
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 3 of 3

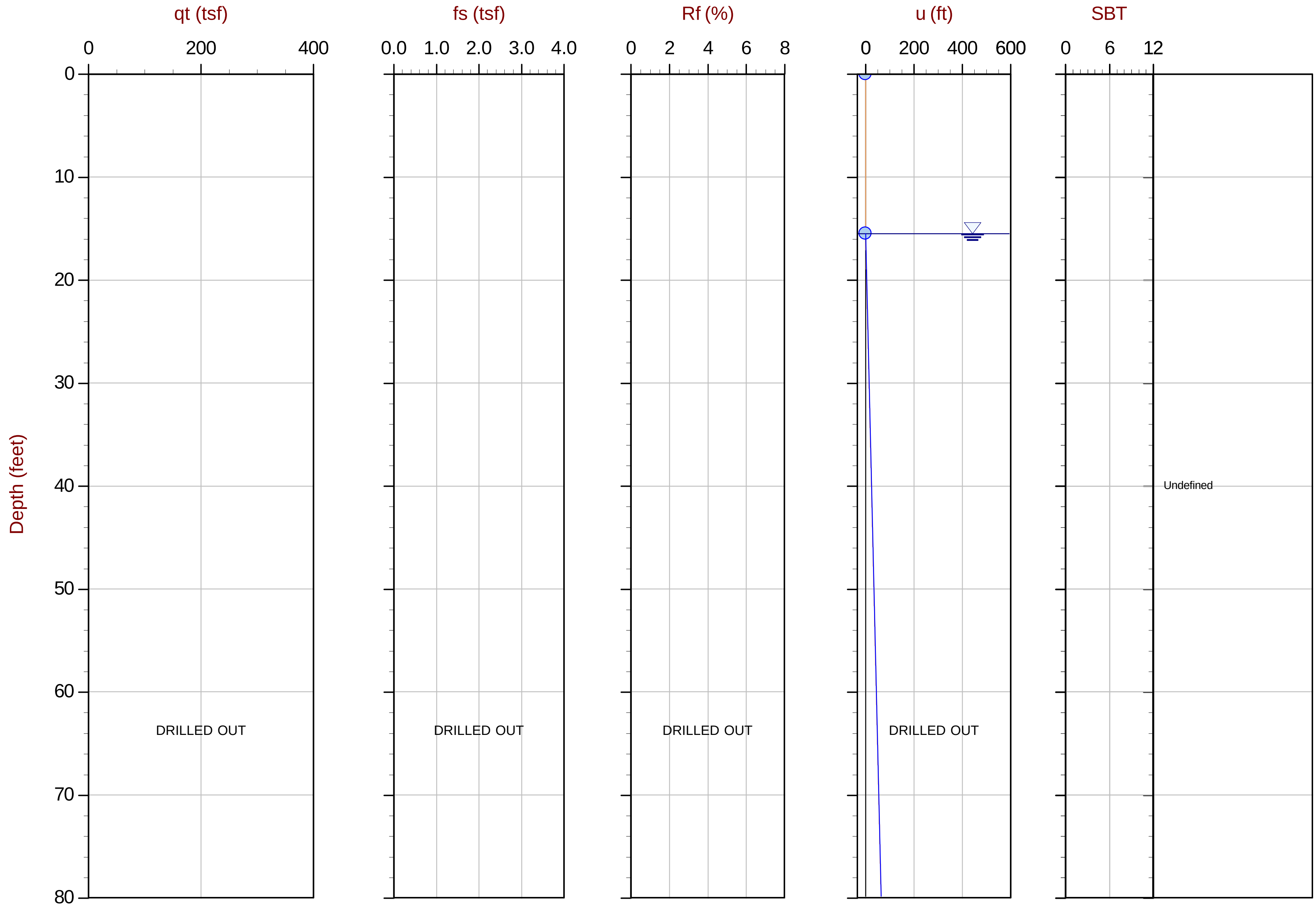
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 1 of 3

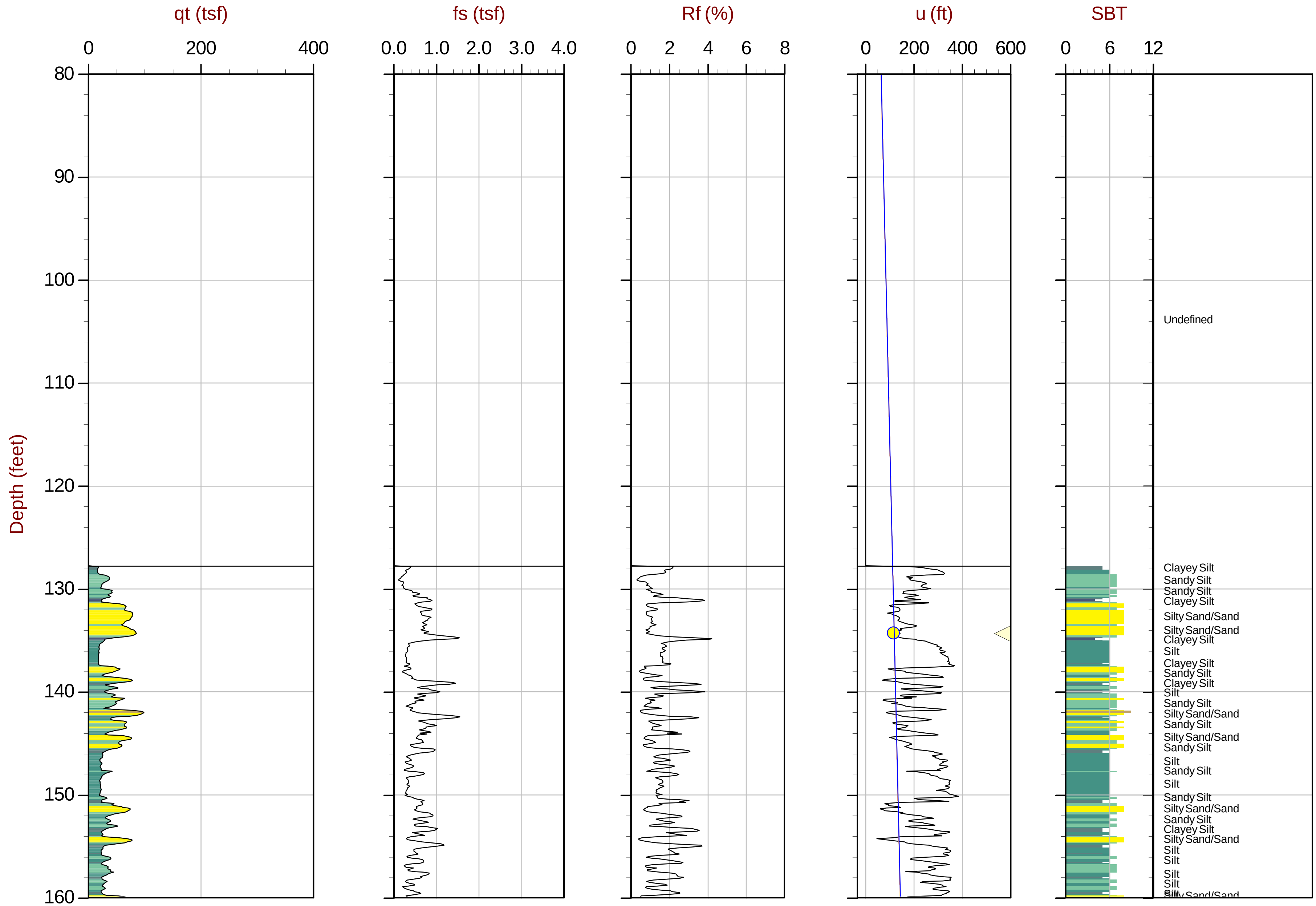
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 2 of 3

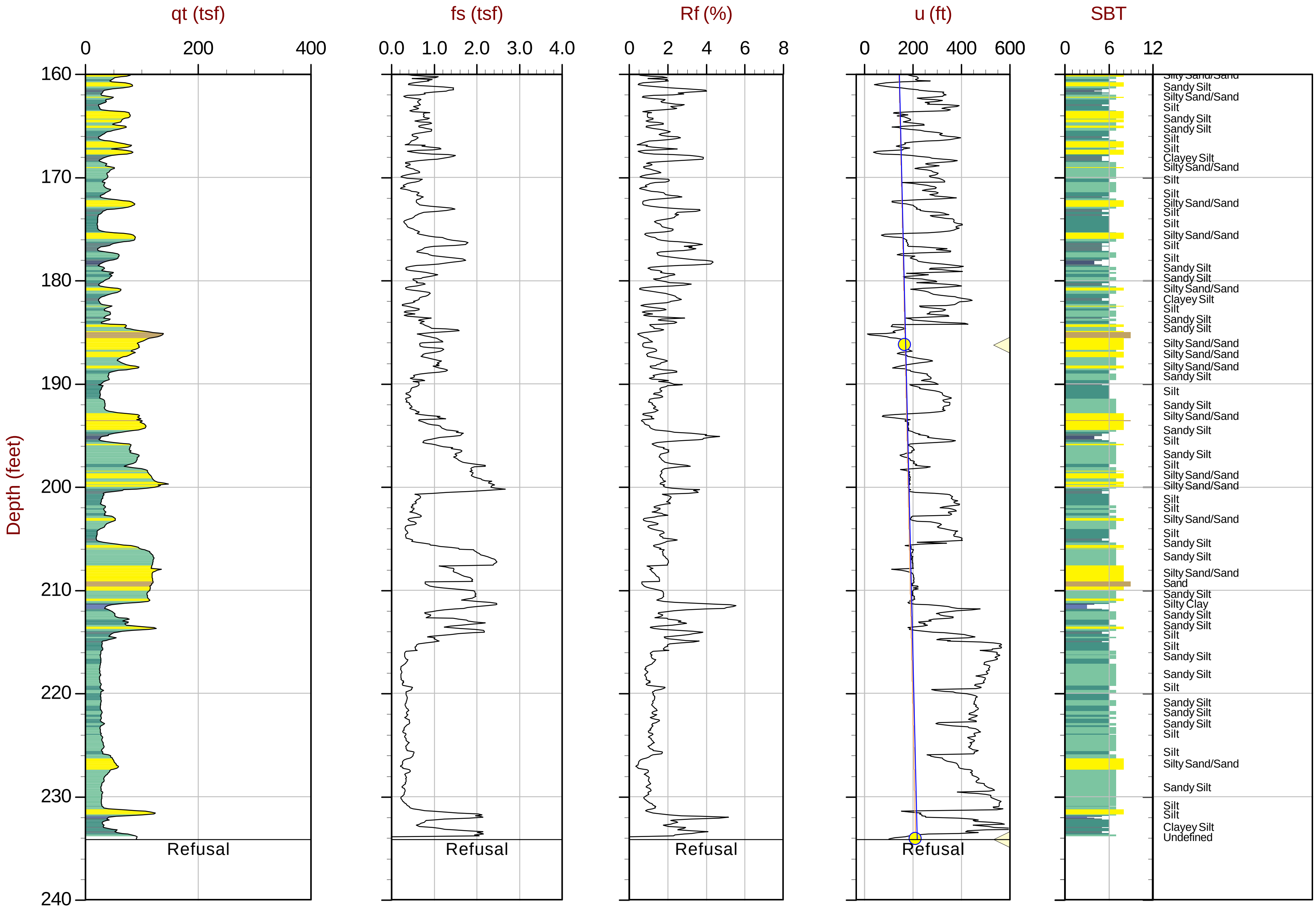
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 3 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Cone Penetration Test Alternate Range Plots

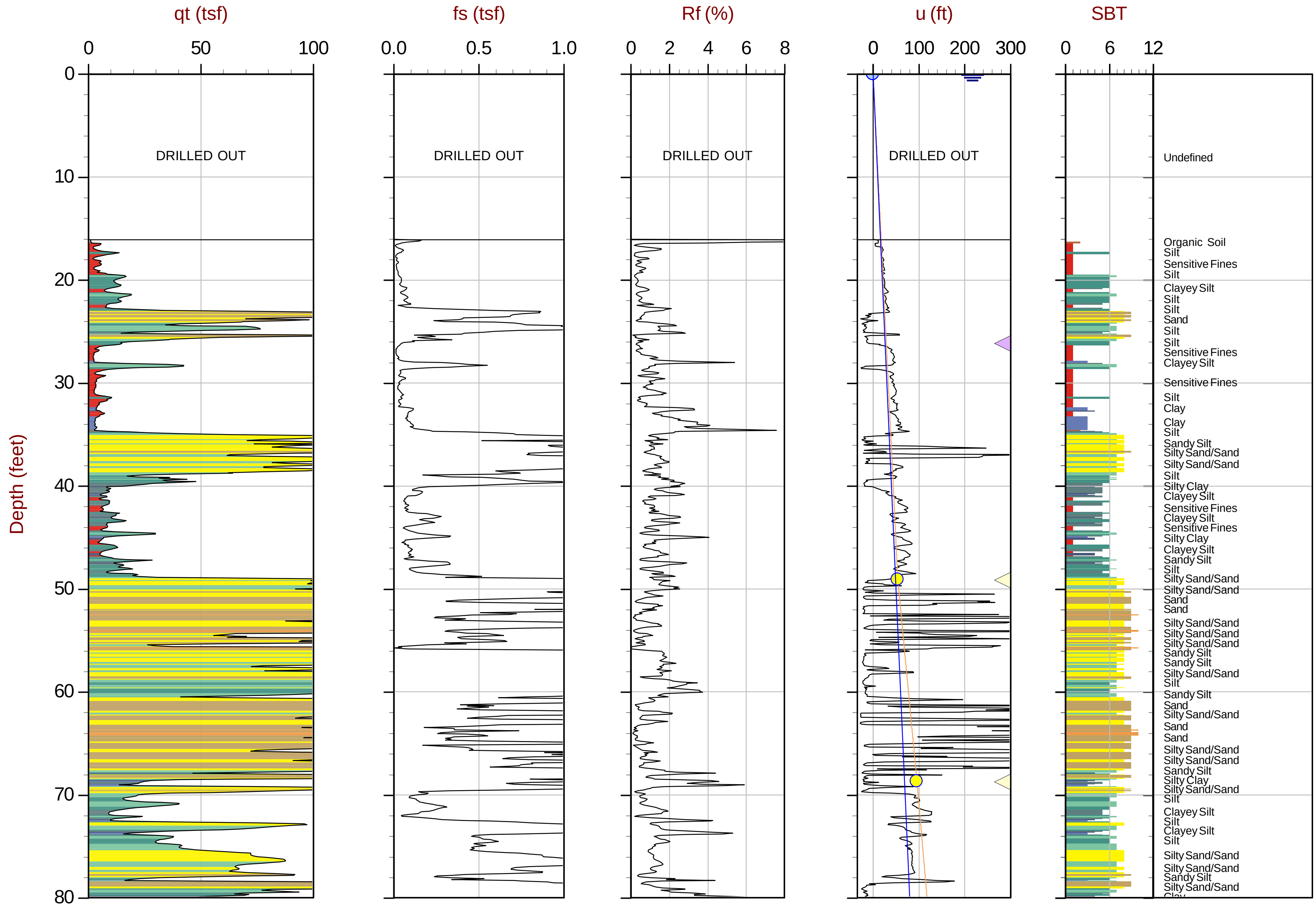
ConeTec

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 1 of 4

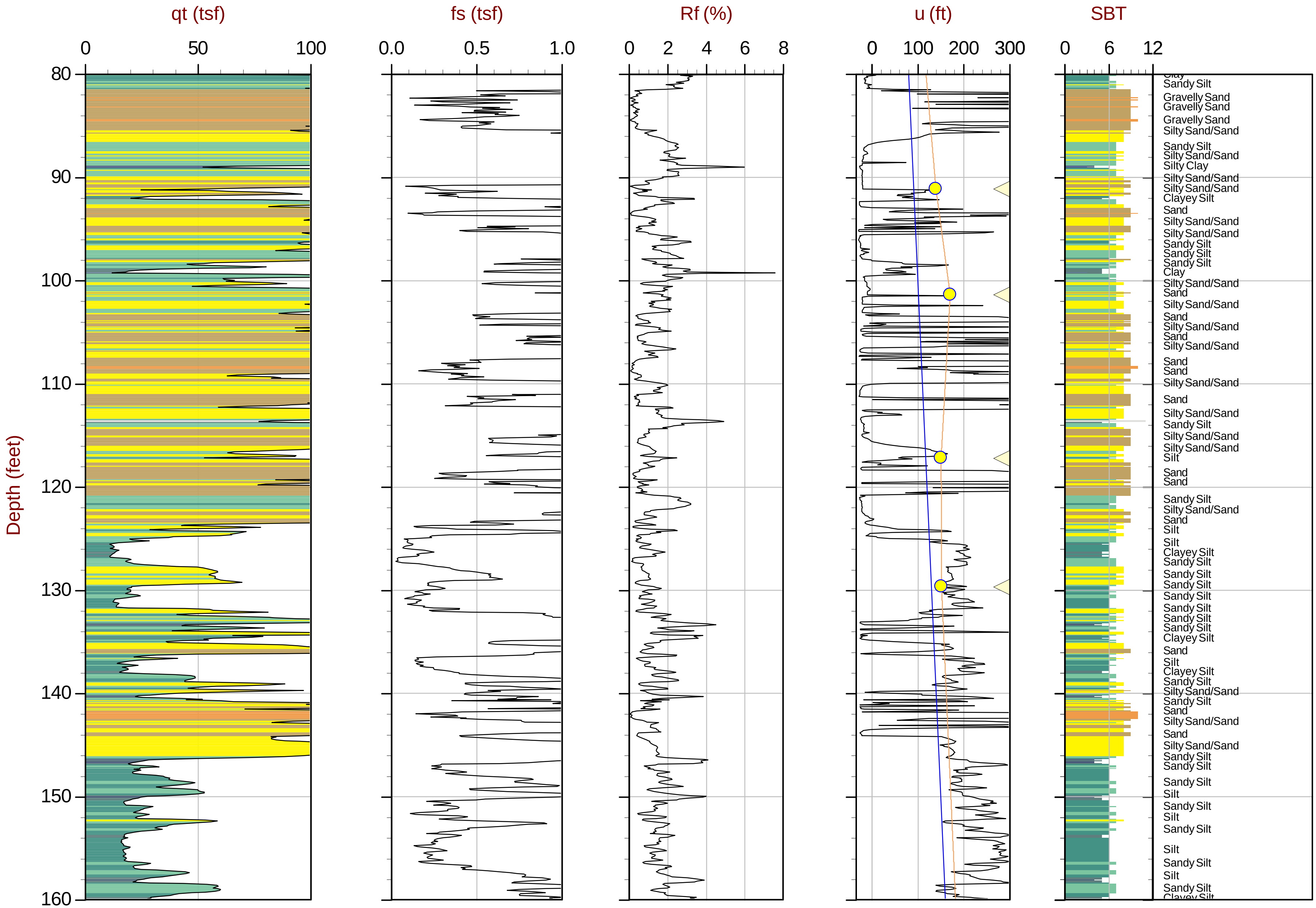
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m

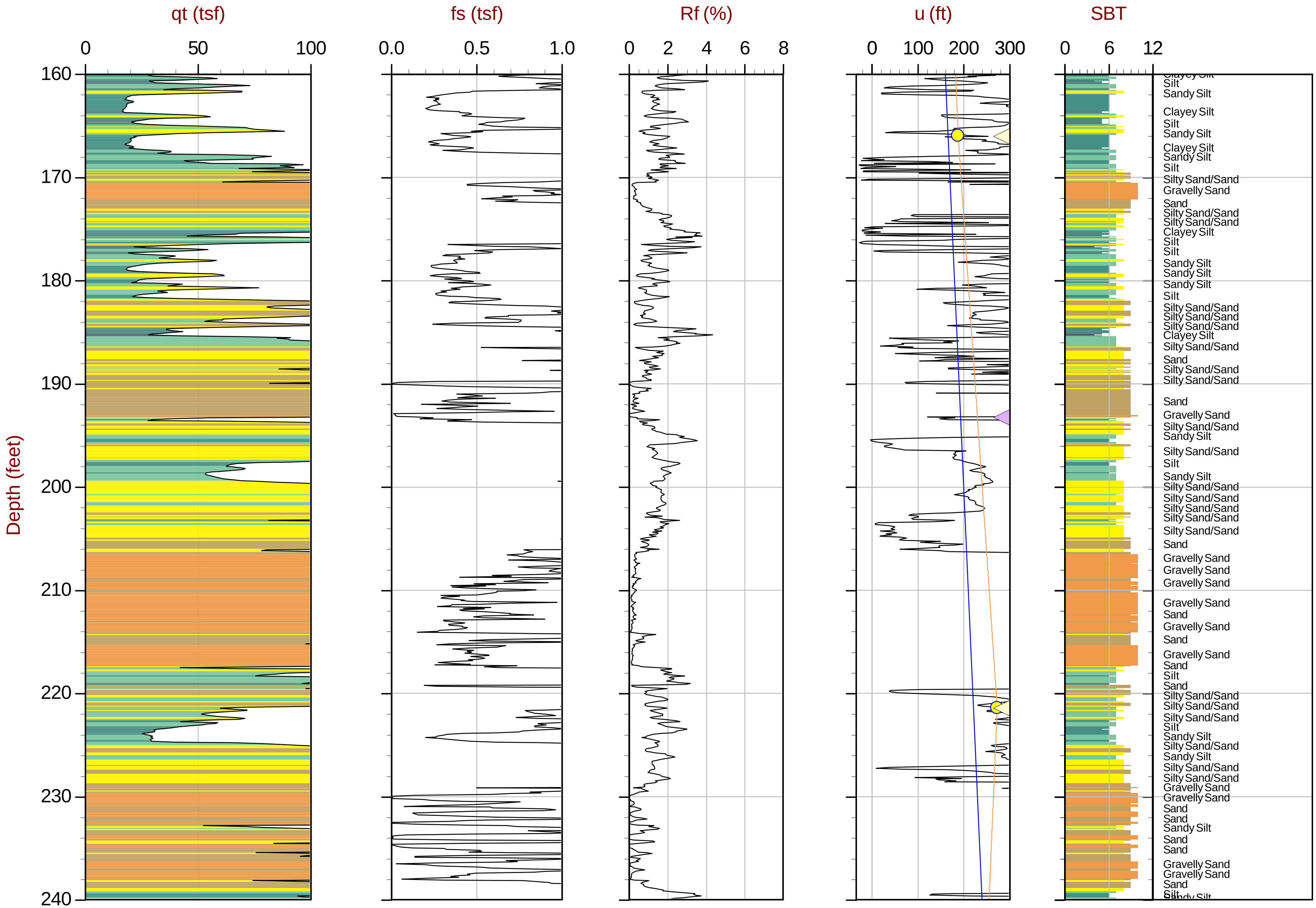
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

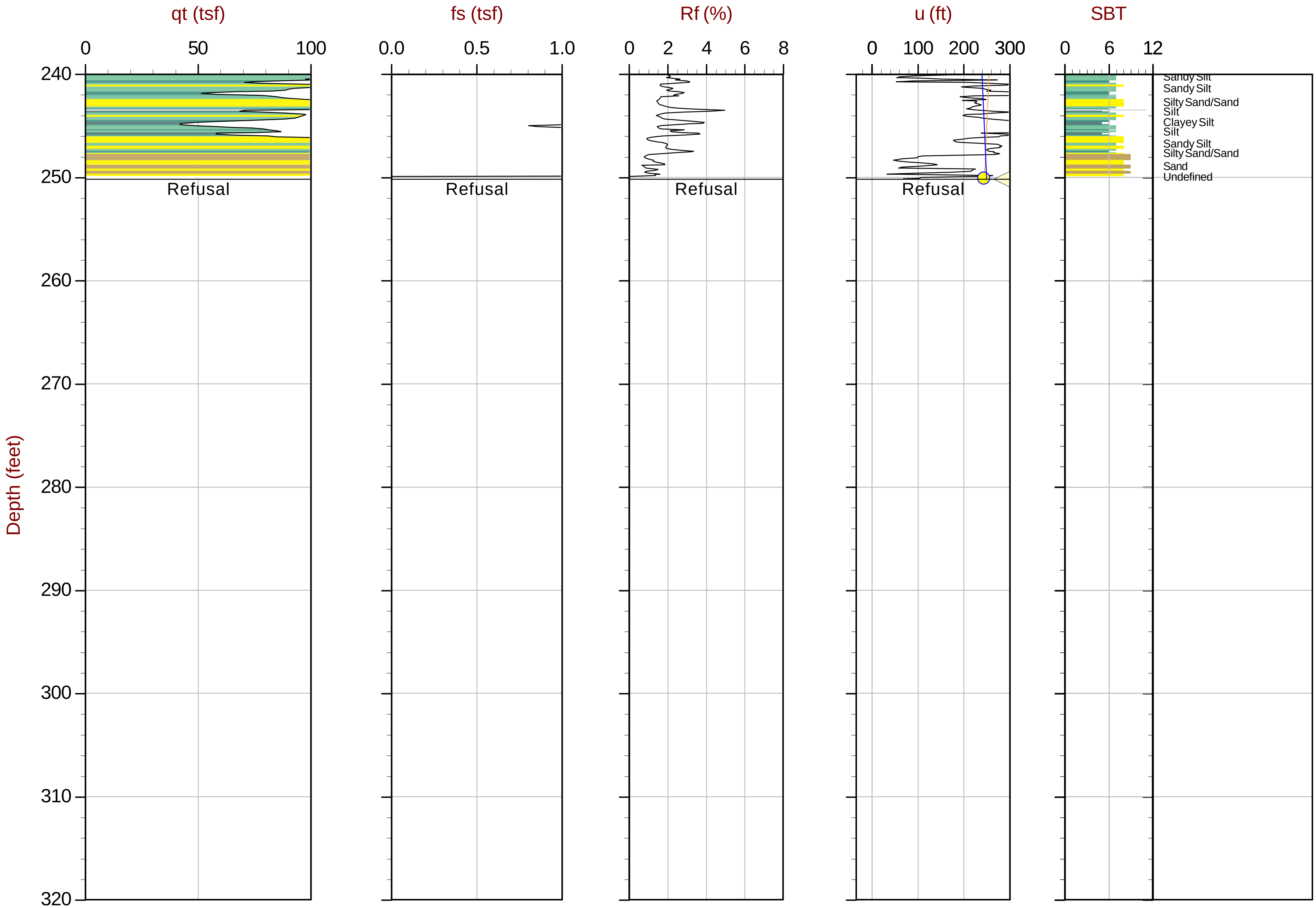
File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 3 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF
Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 4 of 4

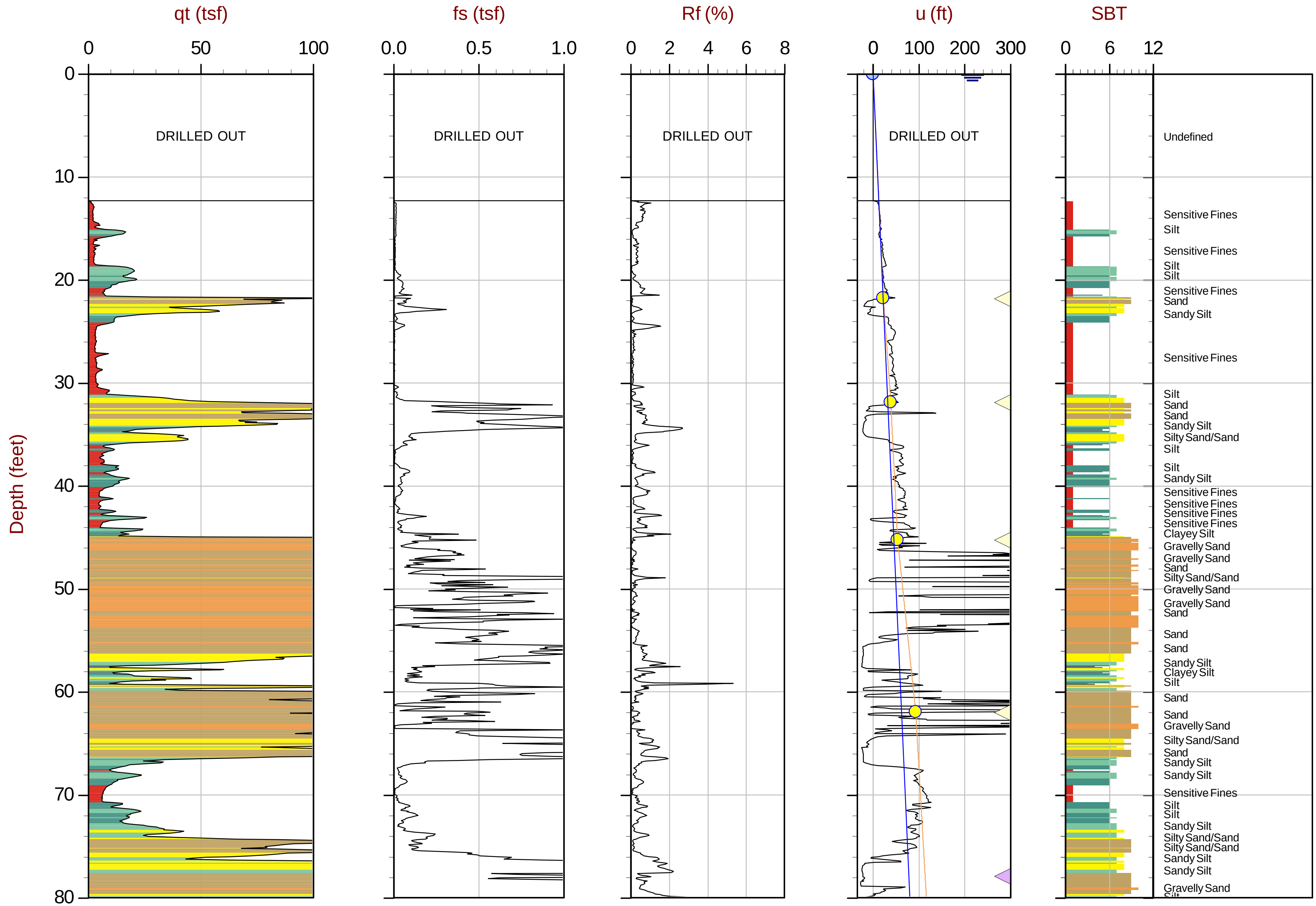
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 1 of 3

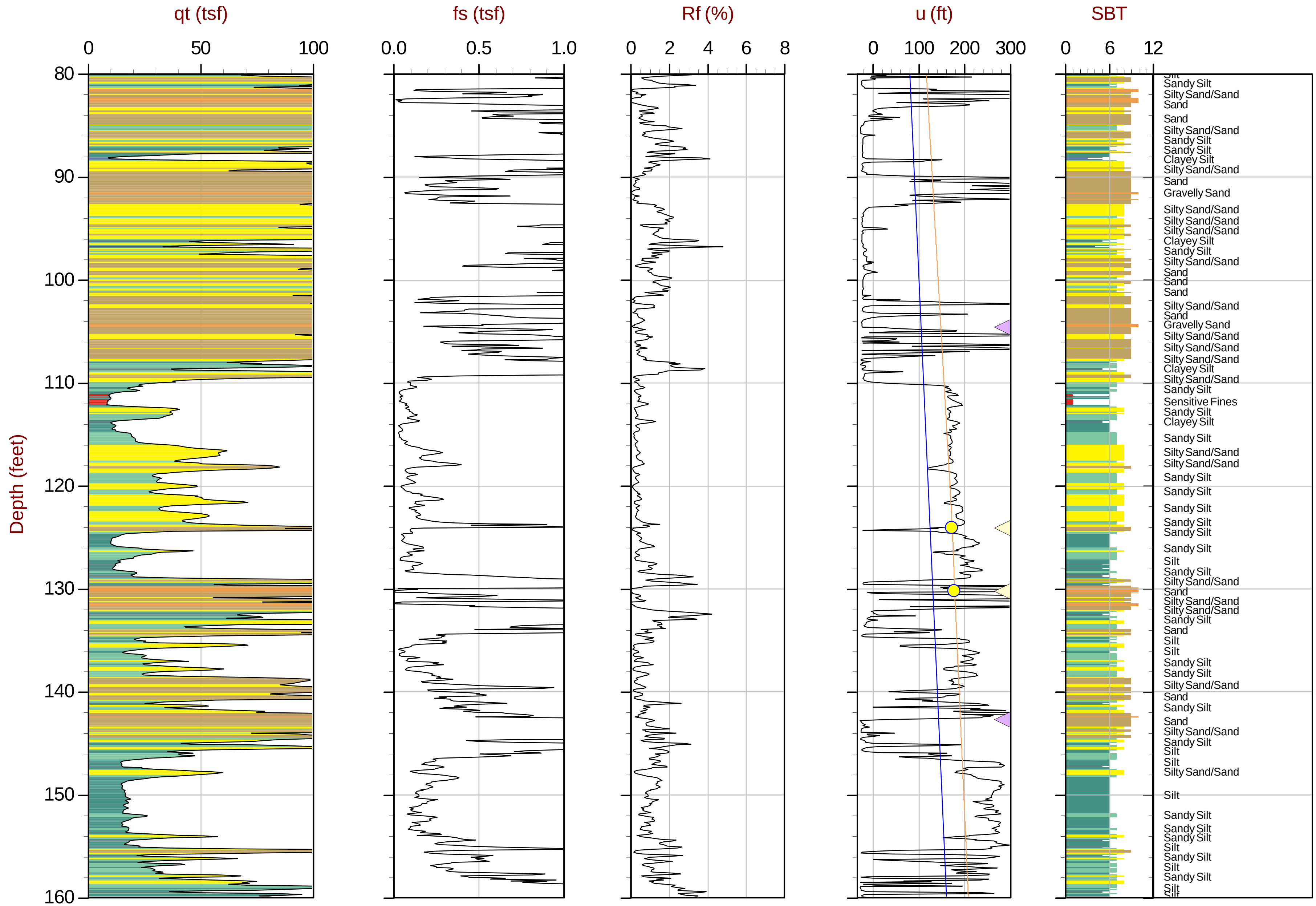
Overplot Item: Assumed Ueq, Ueq, Dissipation, equilibrium achieved, Dissipation, equilibrium not achieved, Equilibrium profile, Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 2 of 3

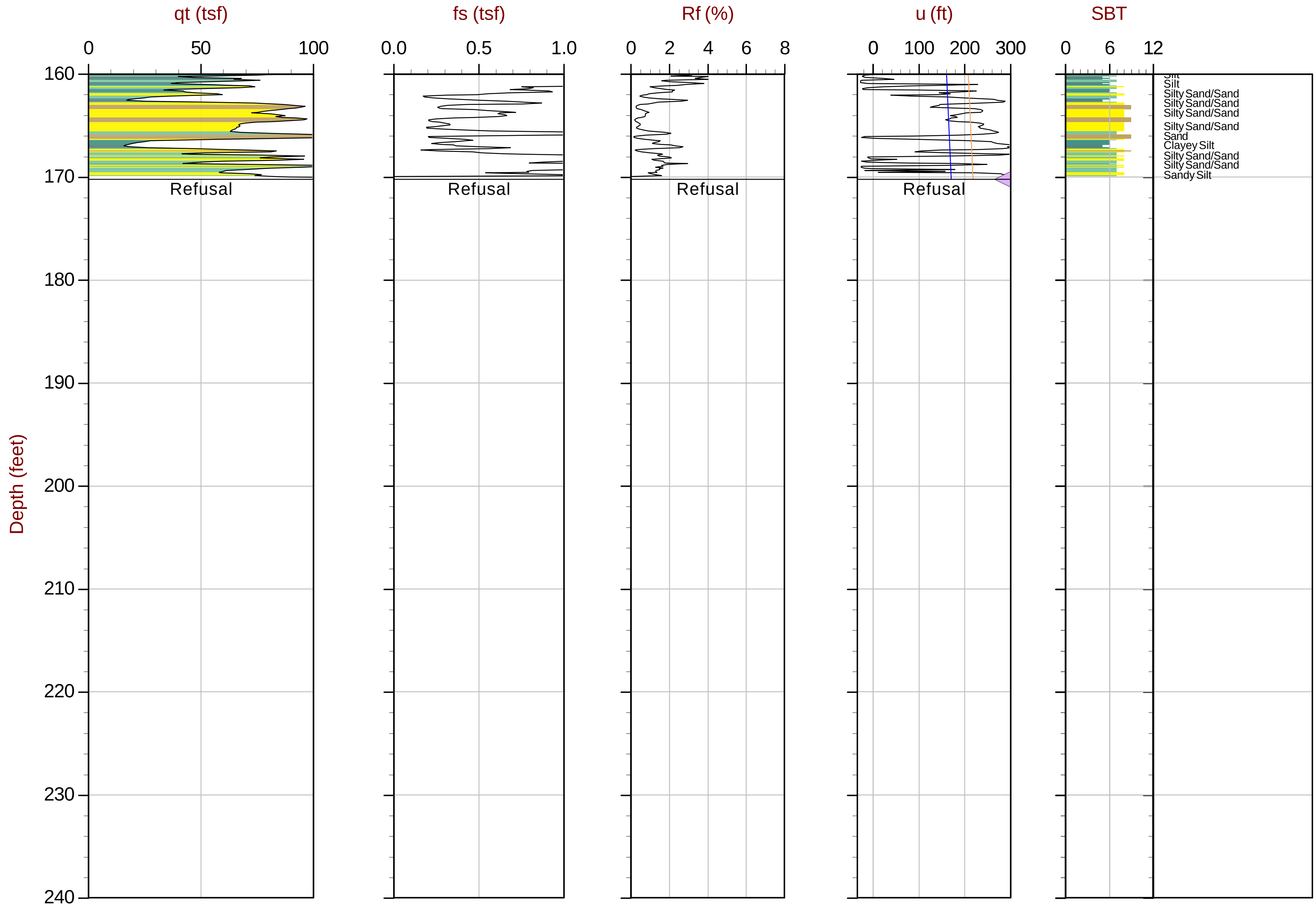
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K

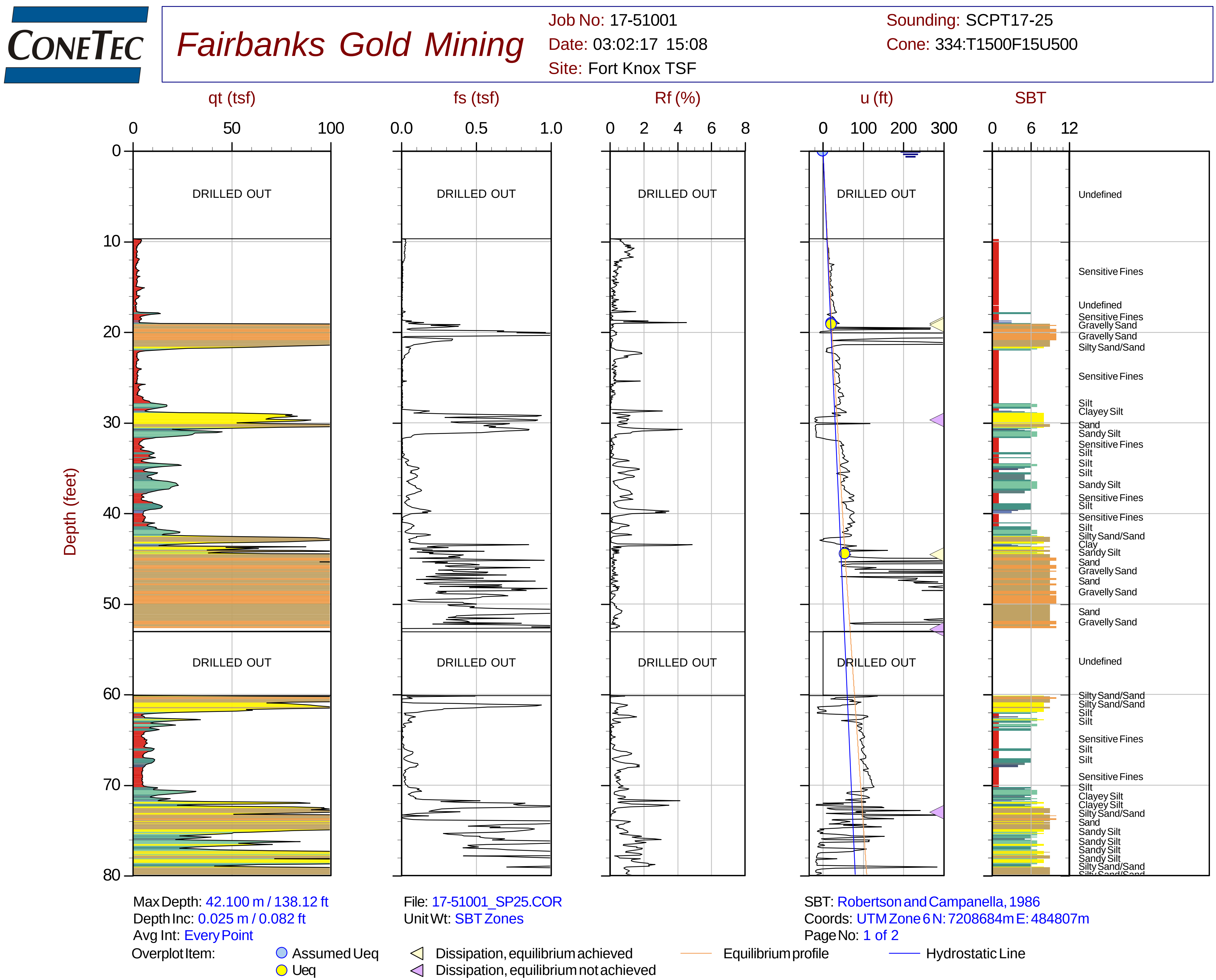


Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 3 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line



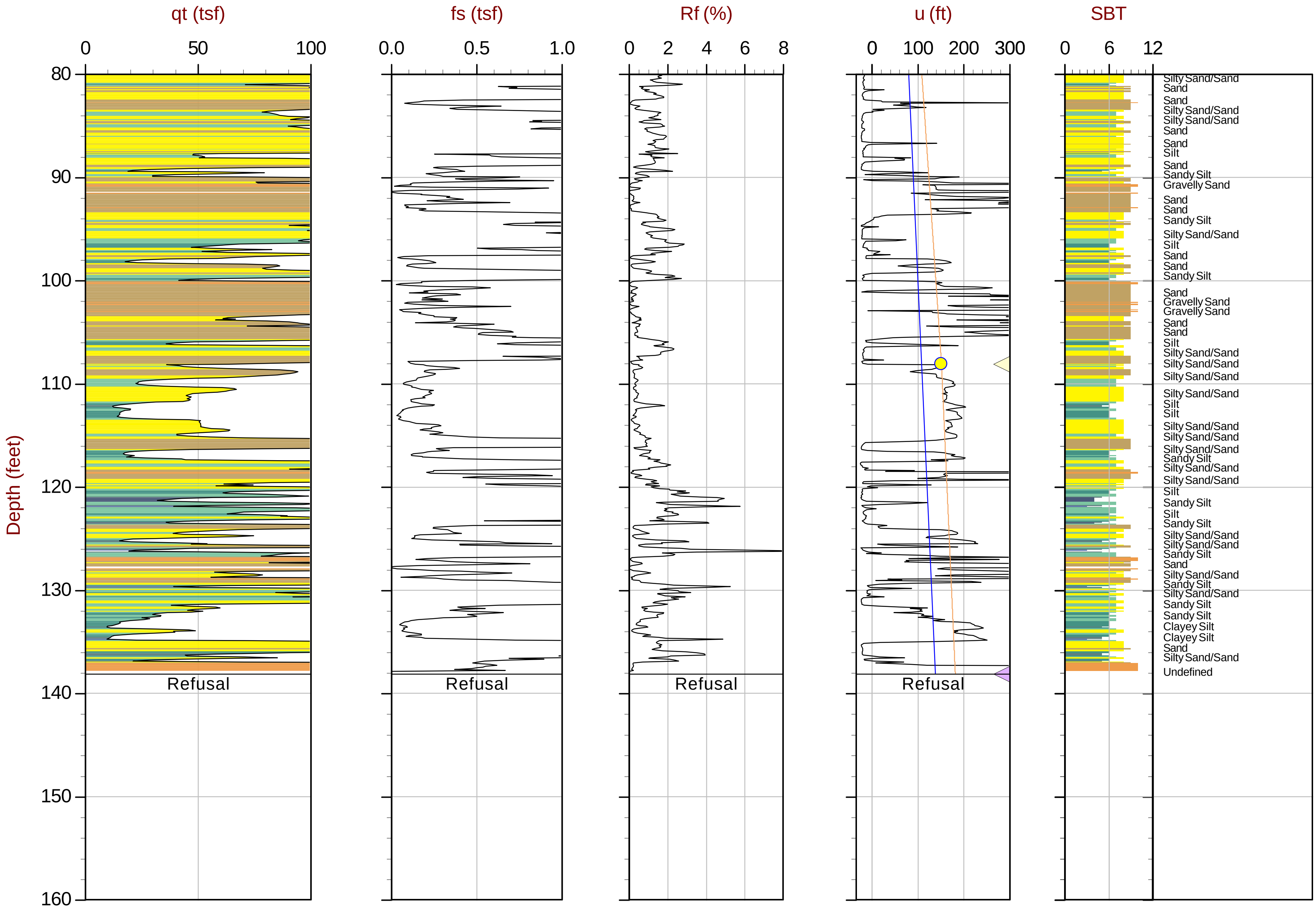
ConeTec
Fairbanks Gold Mining
Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF
Sounding: SCPT17-25
Cone: 334:T1500F15U500
qt (tsf)
fs (tsf)
Rf (%)
u (ft)
SBT
Depth (feet)
DRILLED OUT
Undefined
Sensitive Fines
Gravelly Sand
Silty Sand/Sand
Silt
Clayey Silt
Sand
Sandy Silt
Clay
Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
File: 17-51001_SP25.COR
Unit Wt: SBT Zones
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 1 of 2
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Equilibrium profile
Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 2 of 2

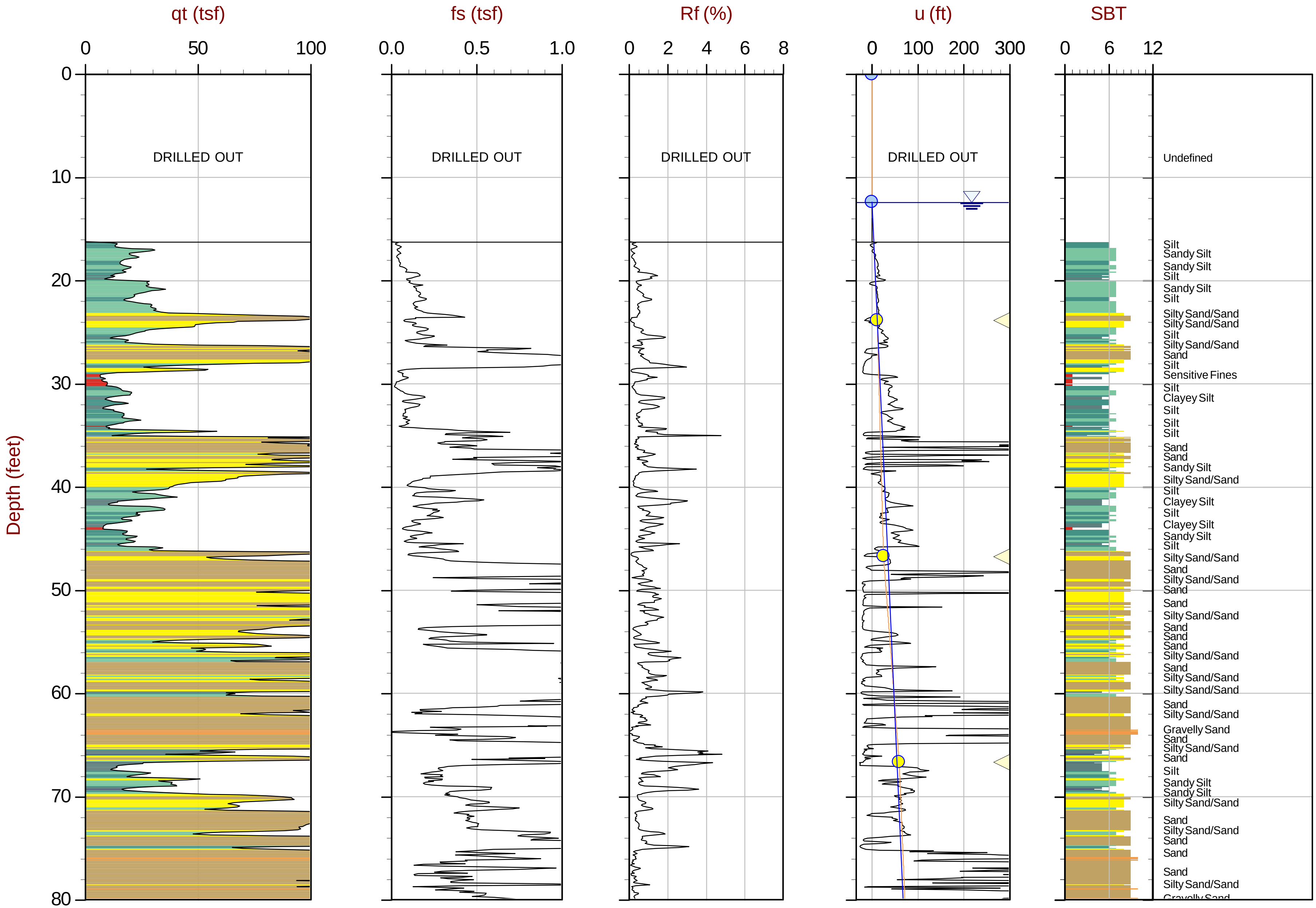
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 1 of 3

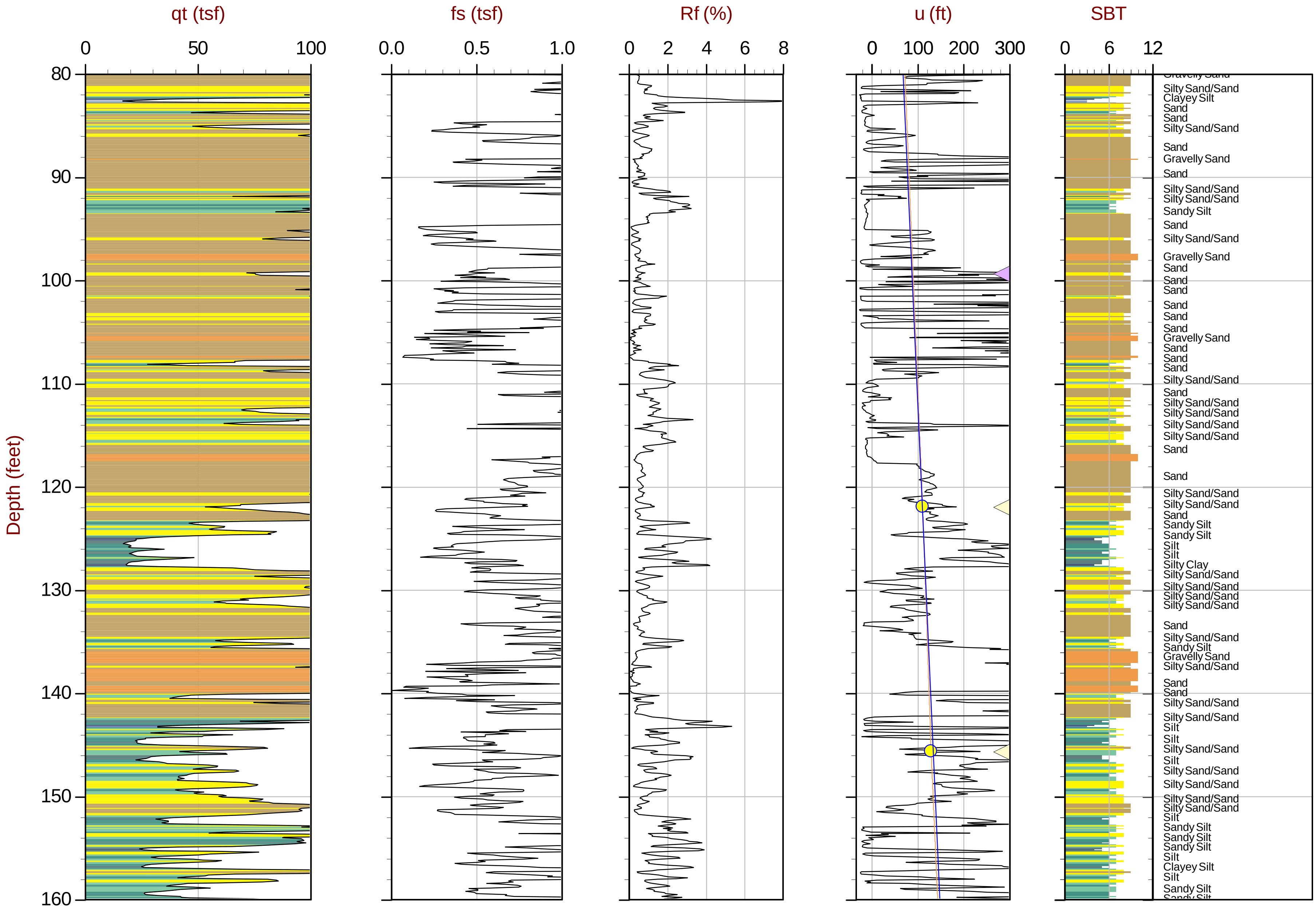
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 2 of 3

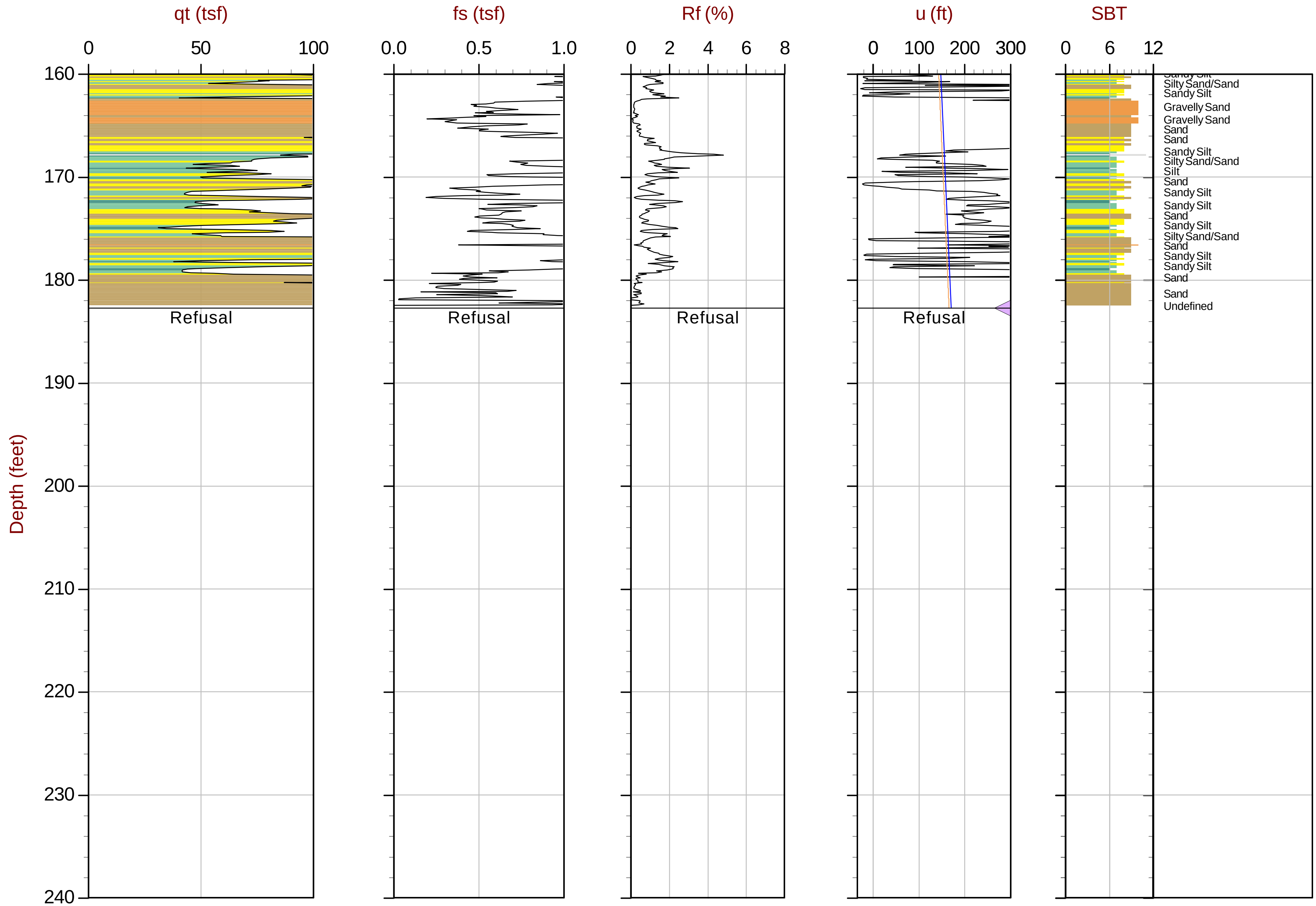
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 3 of 3

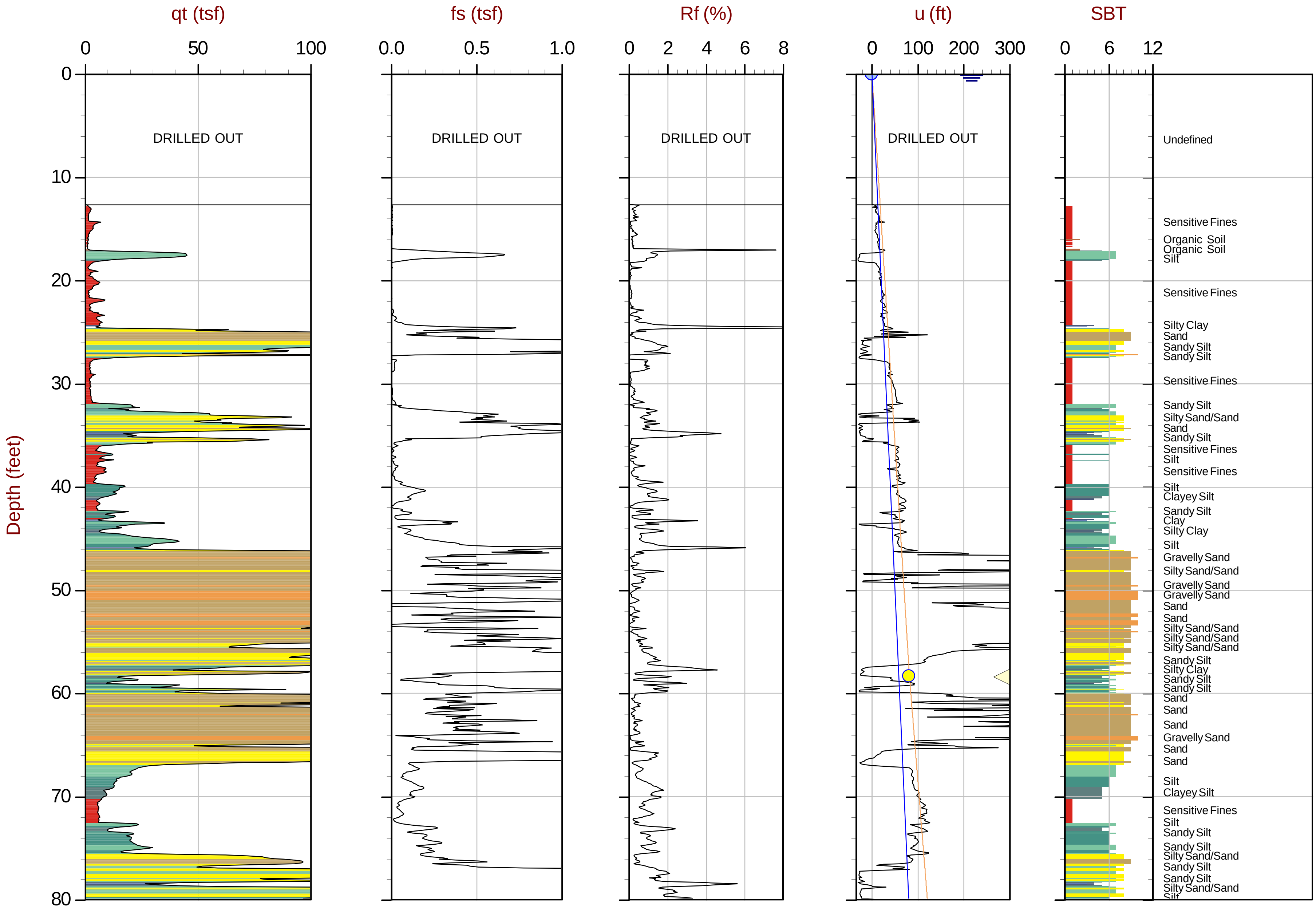
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 1 of 2

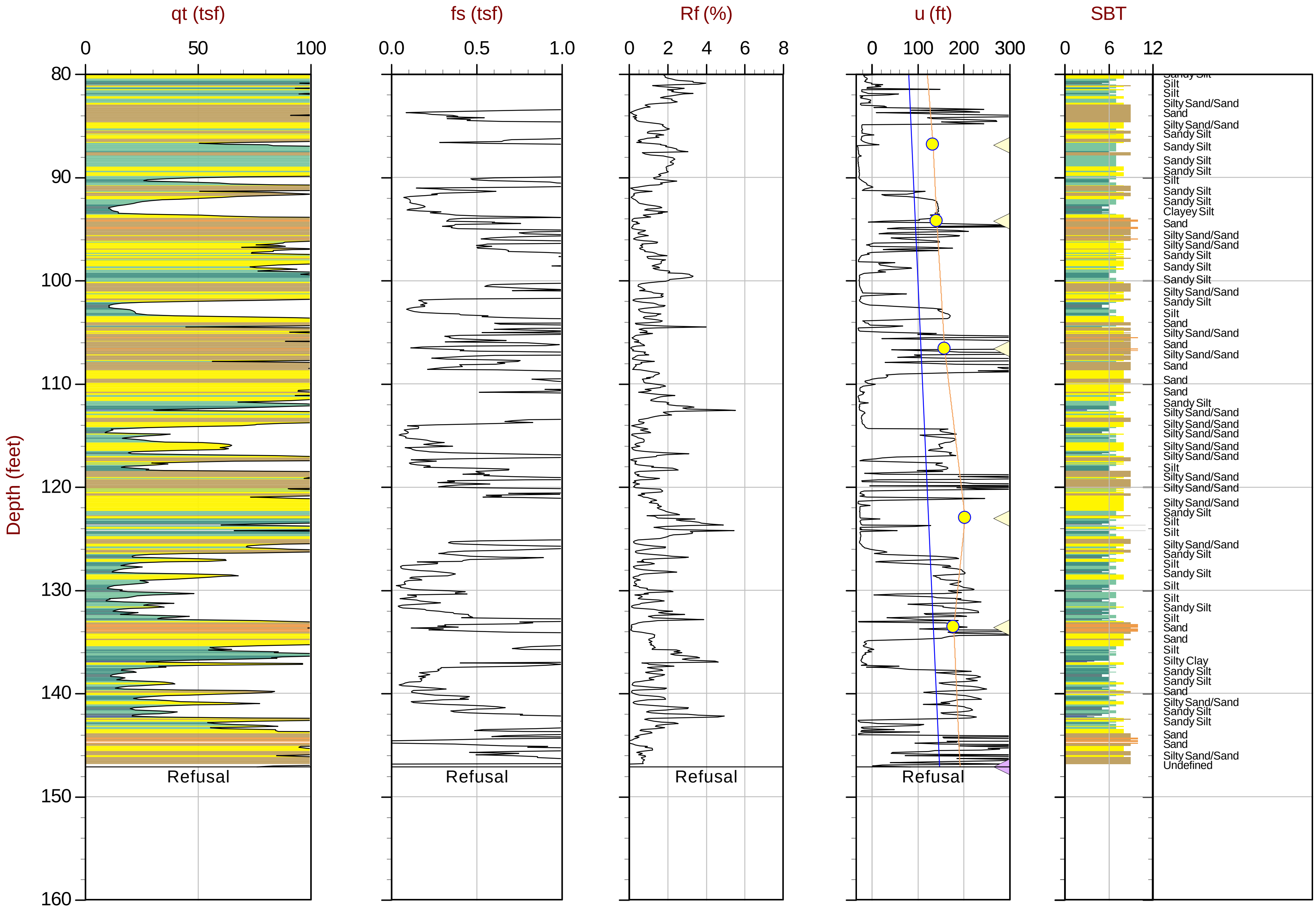
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

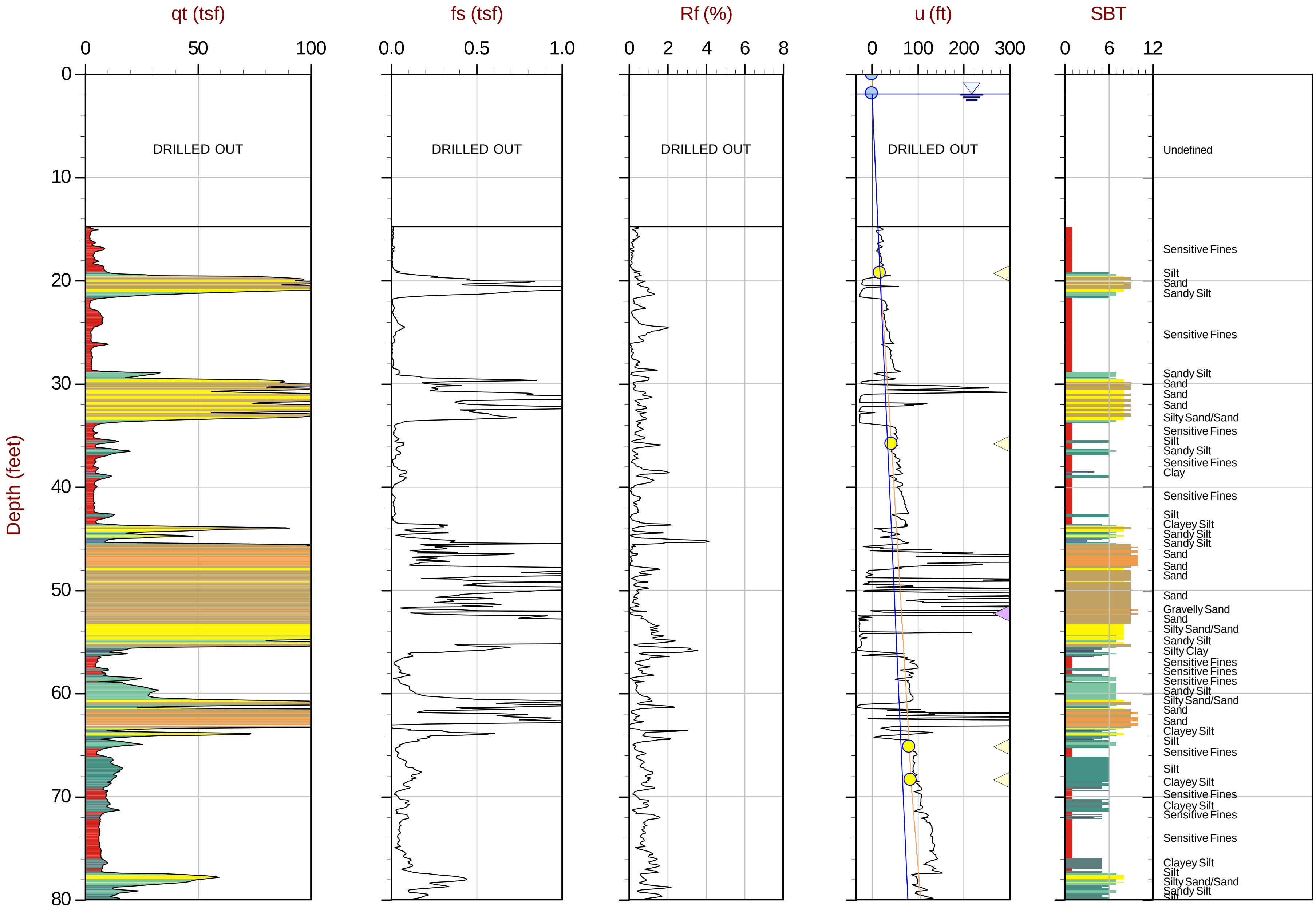
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 2 of 2

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 1 of 4

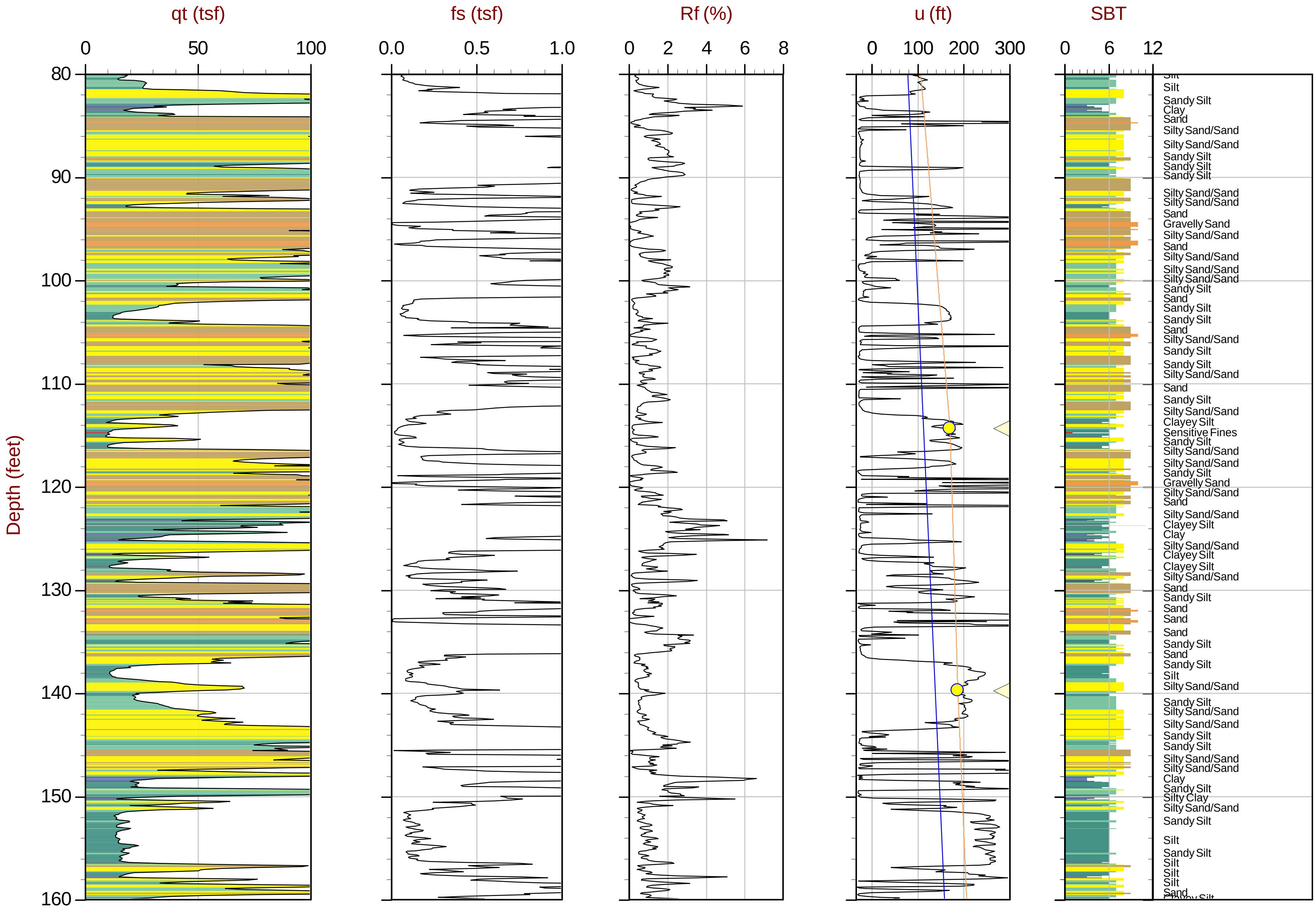
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 2 of 4

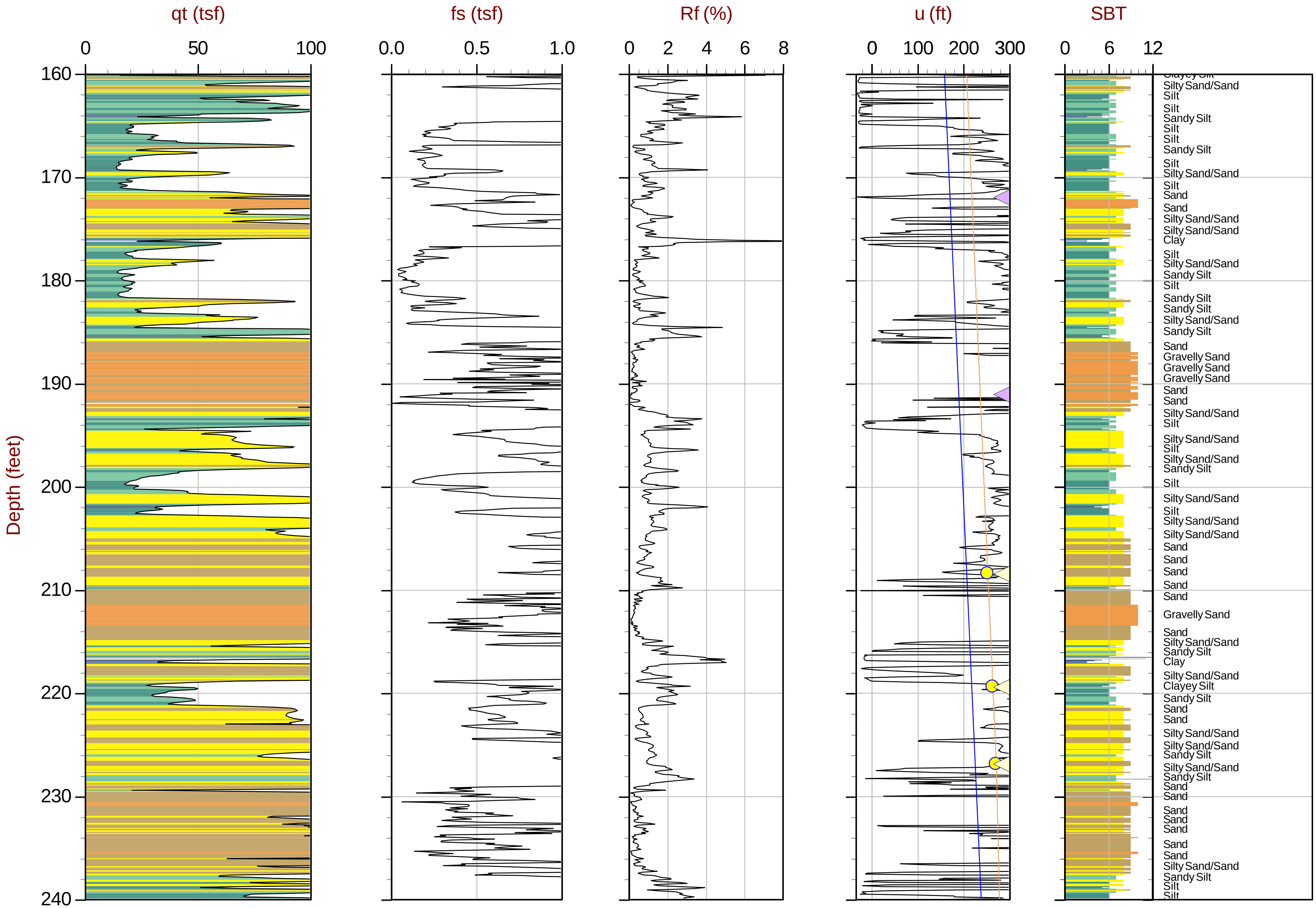
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

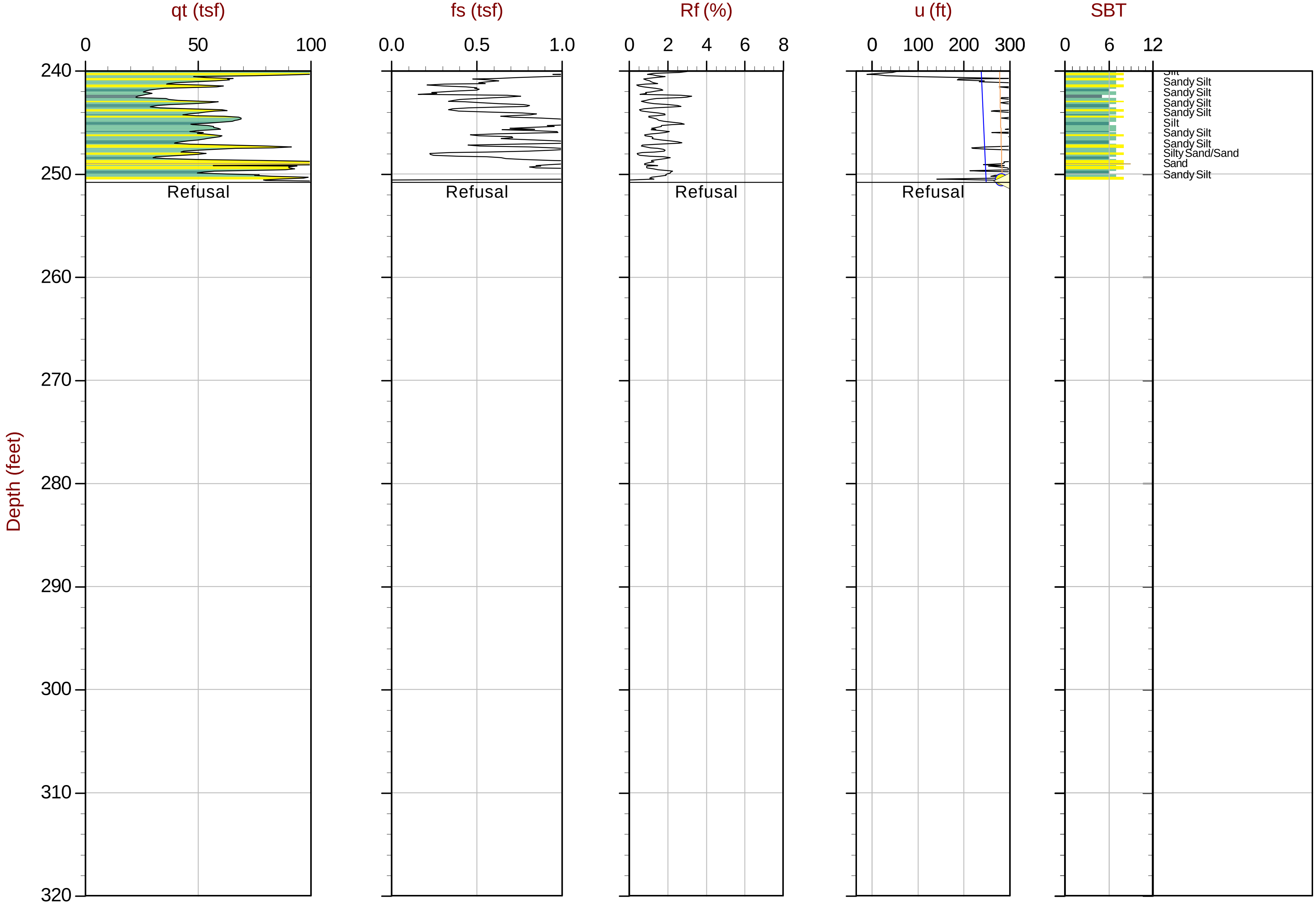
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 3 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 4 of 4

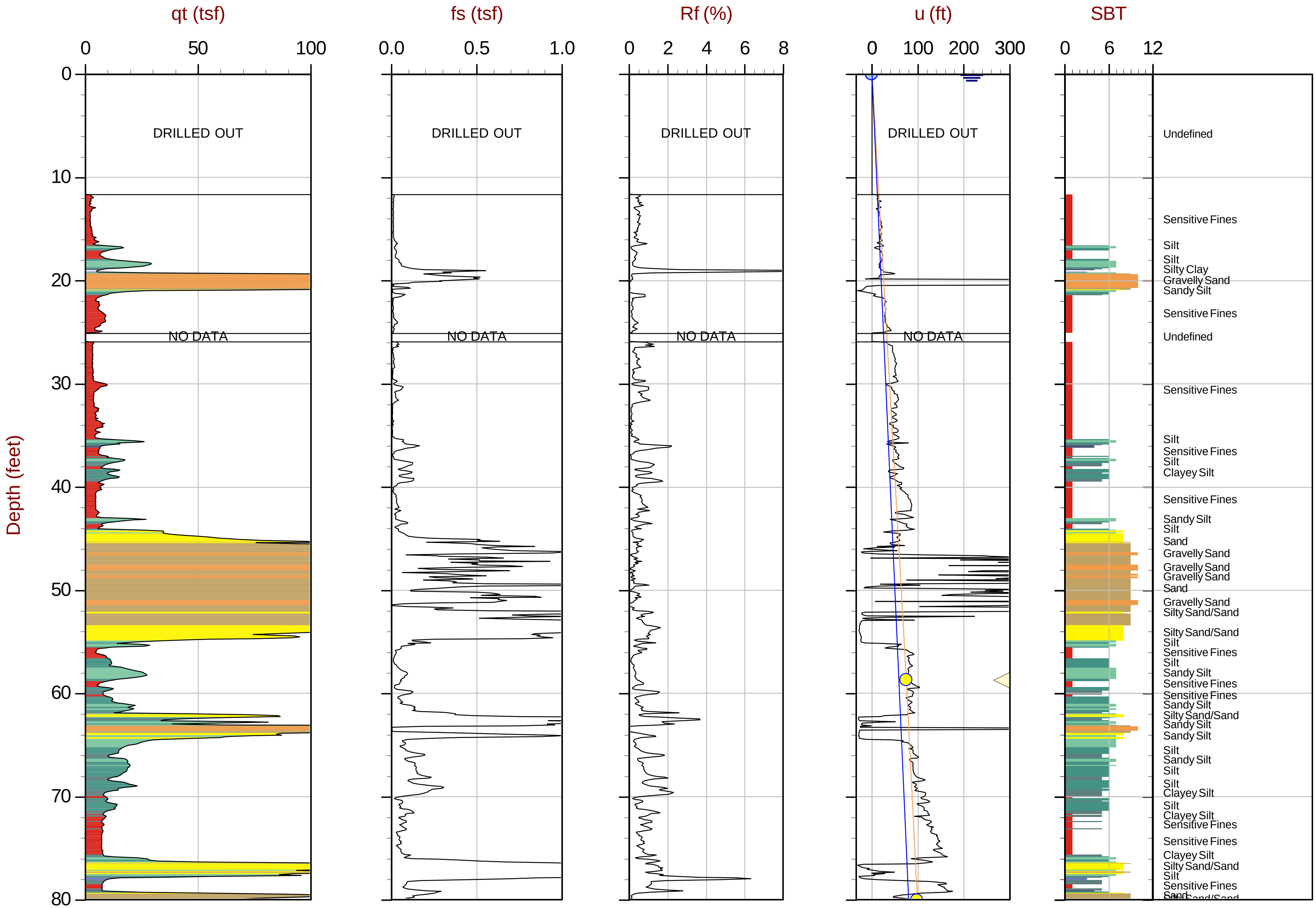
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 1 of 3

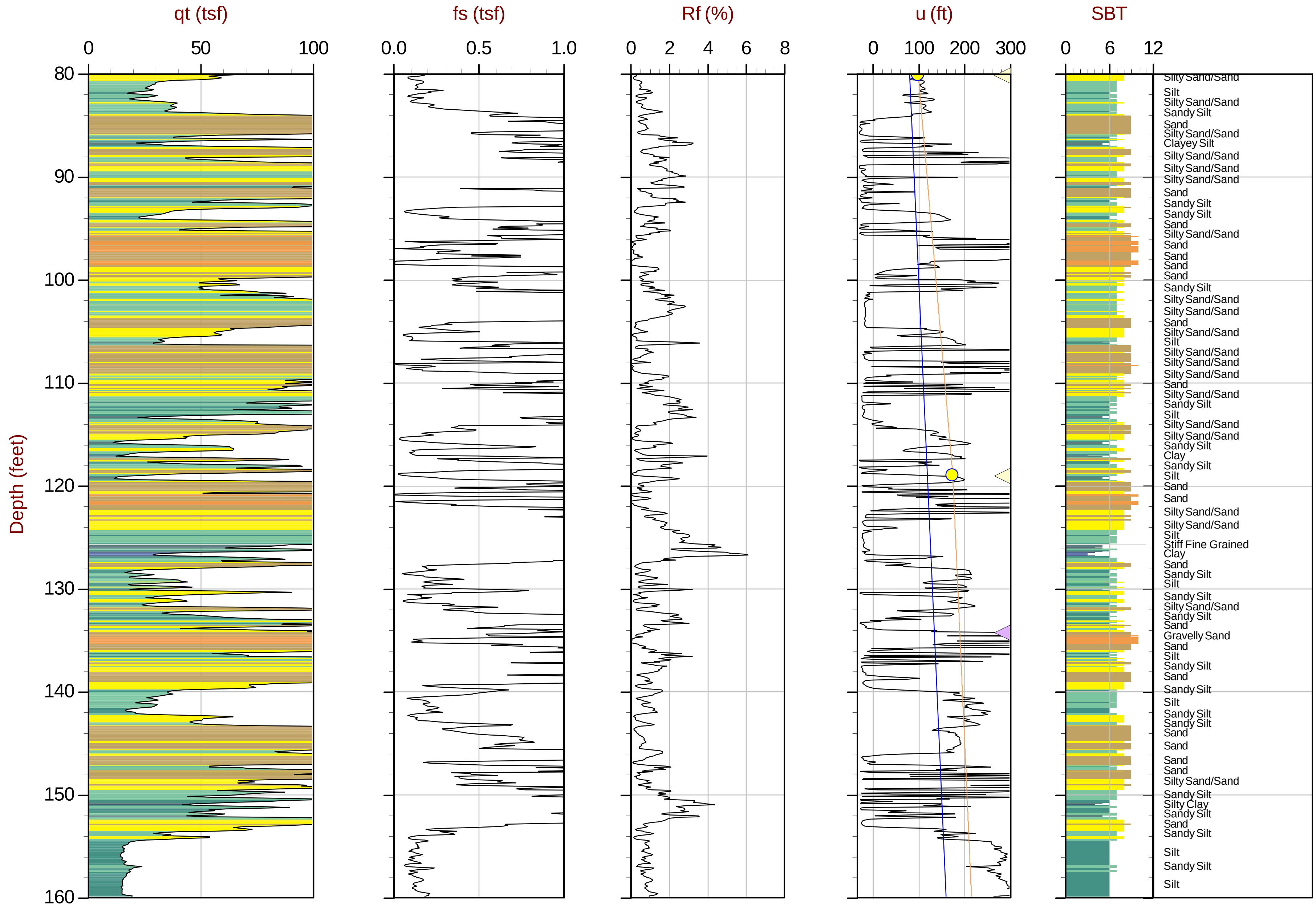
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

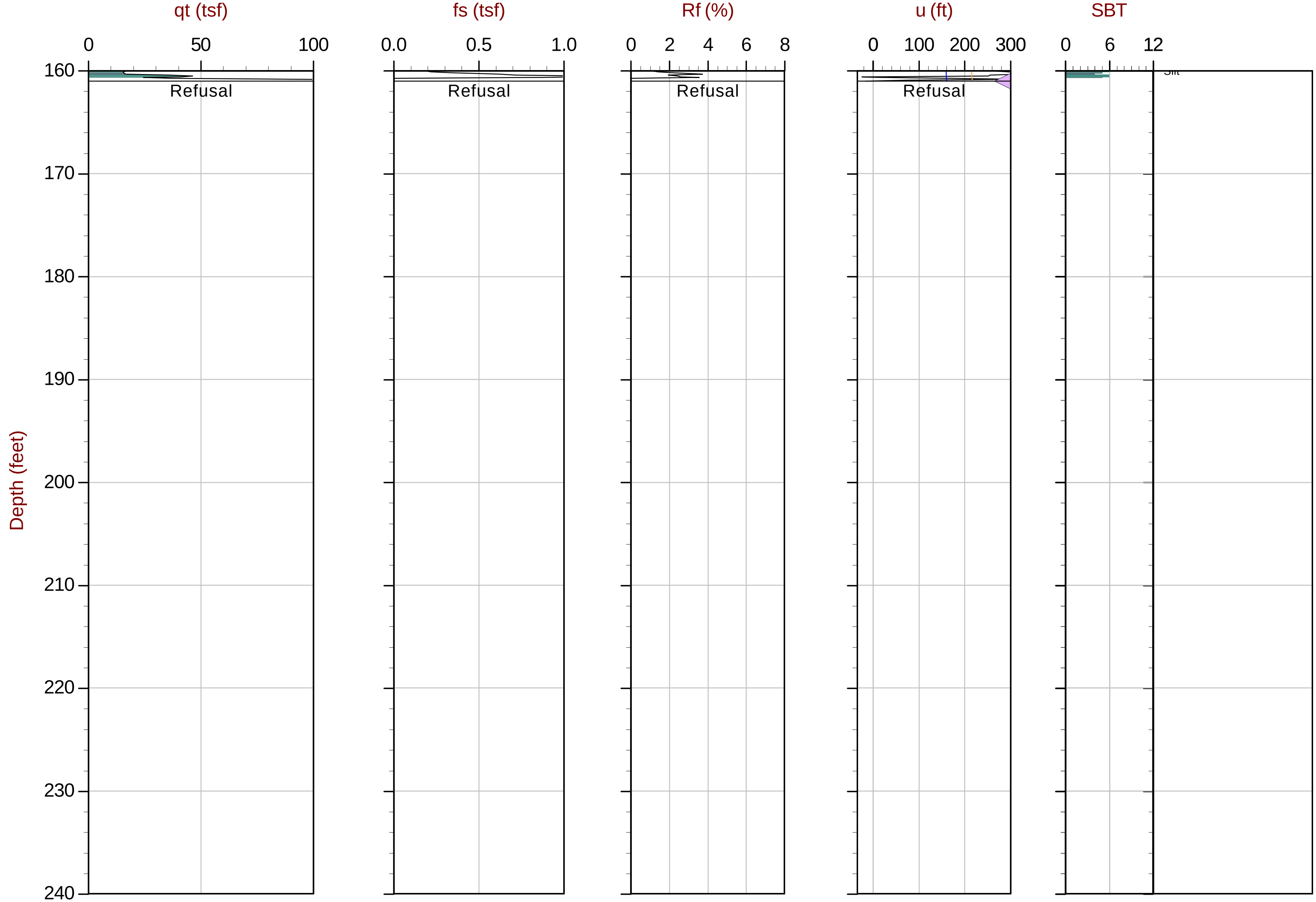
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 2 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF
Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m

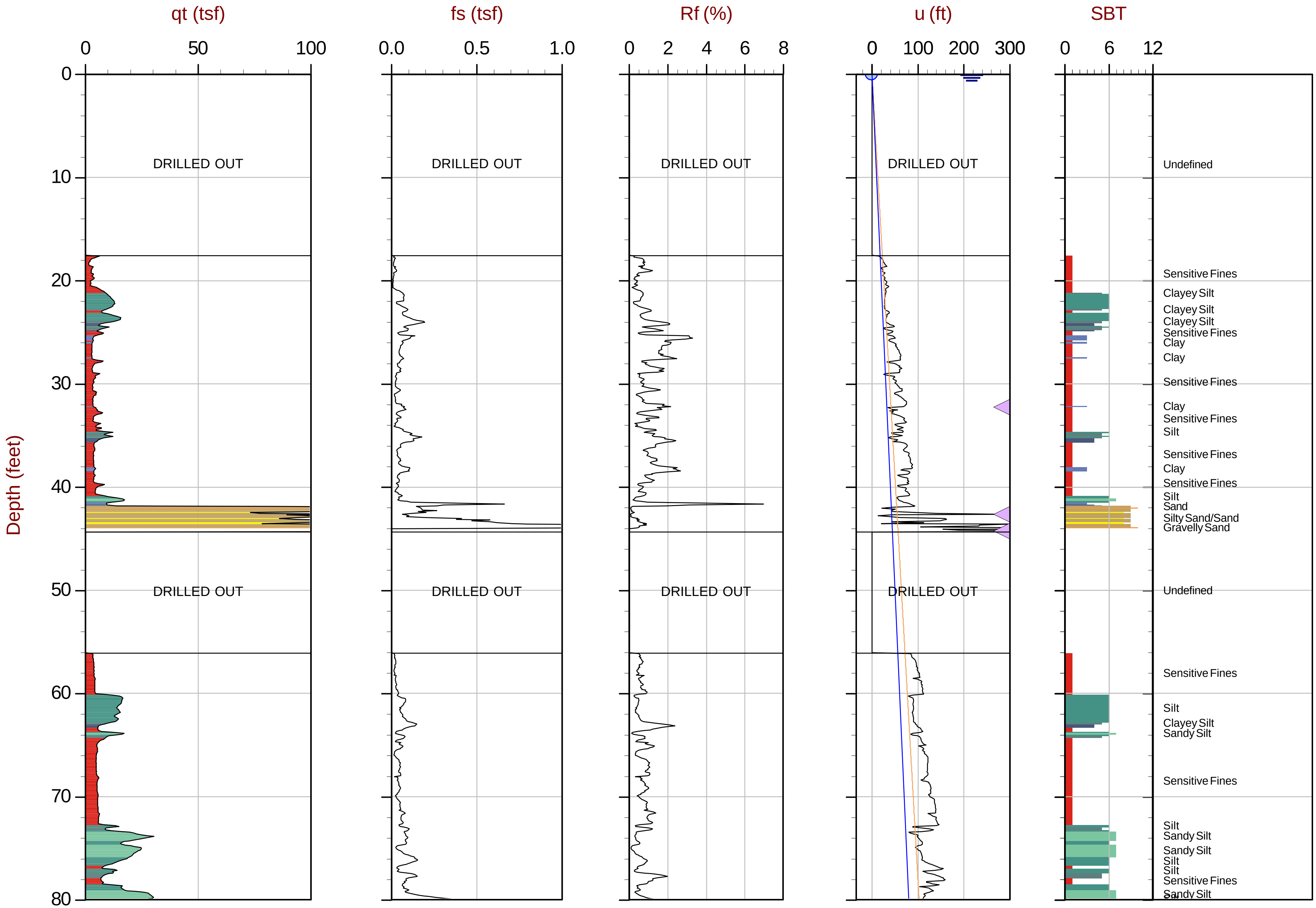
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 1 of 3

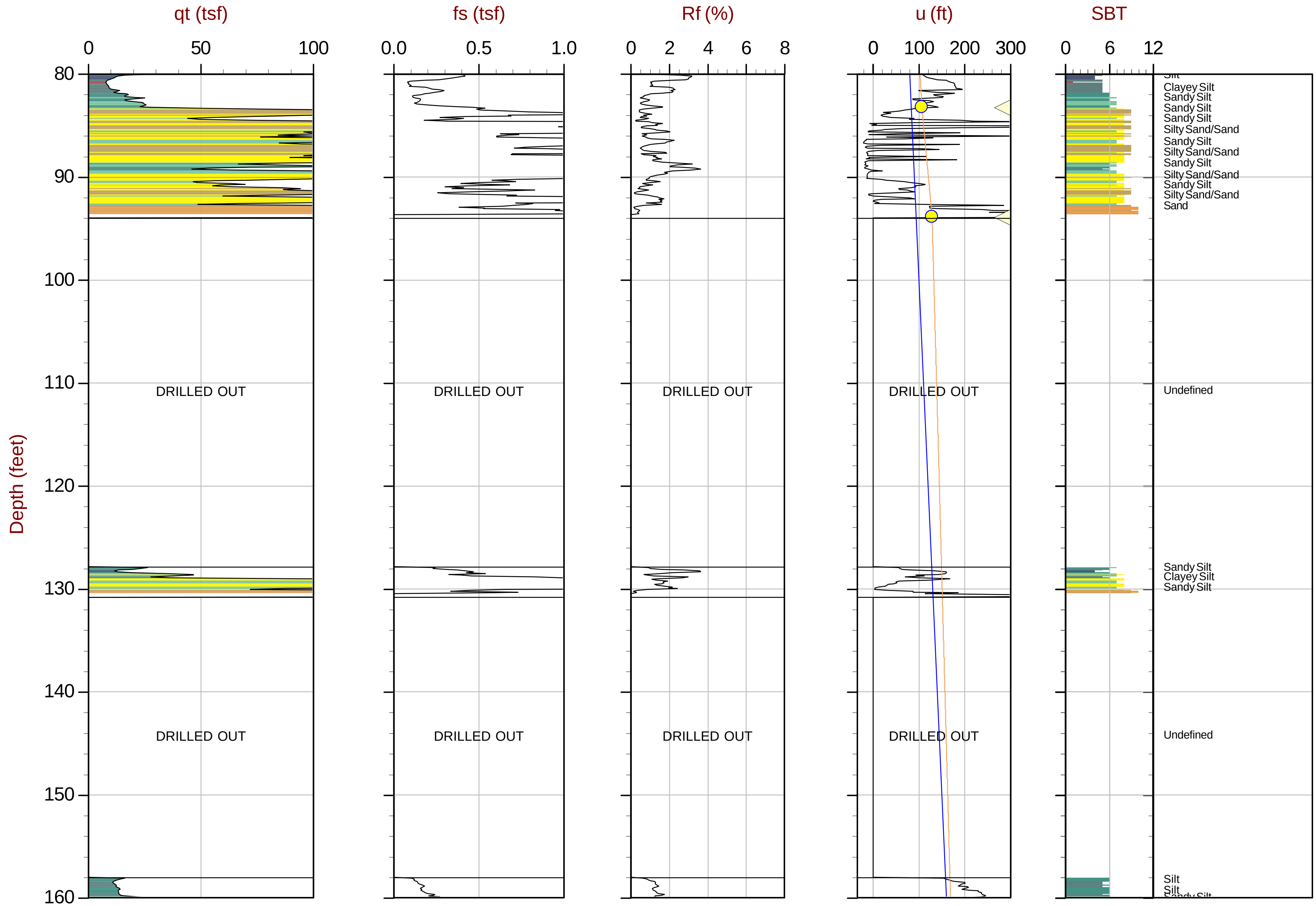
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

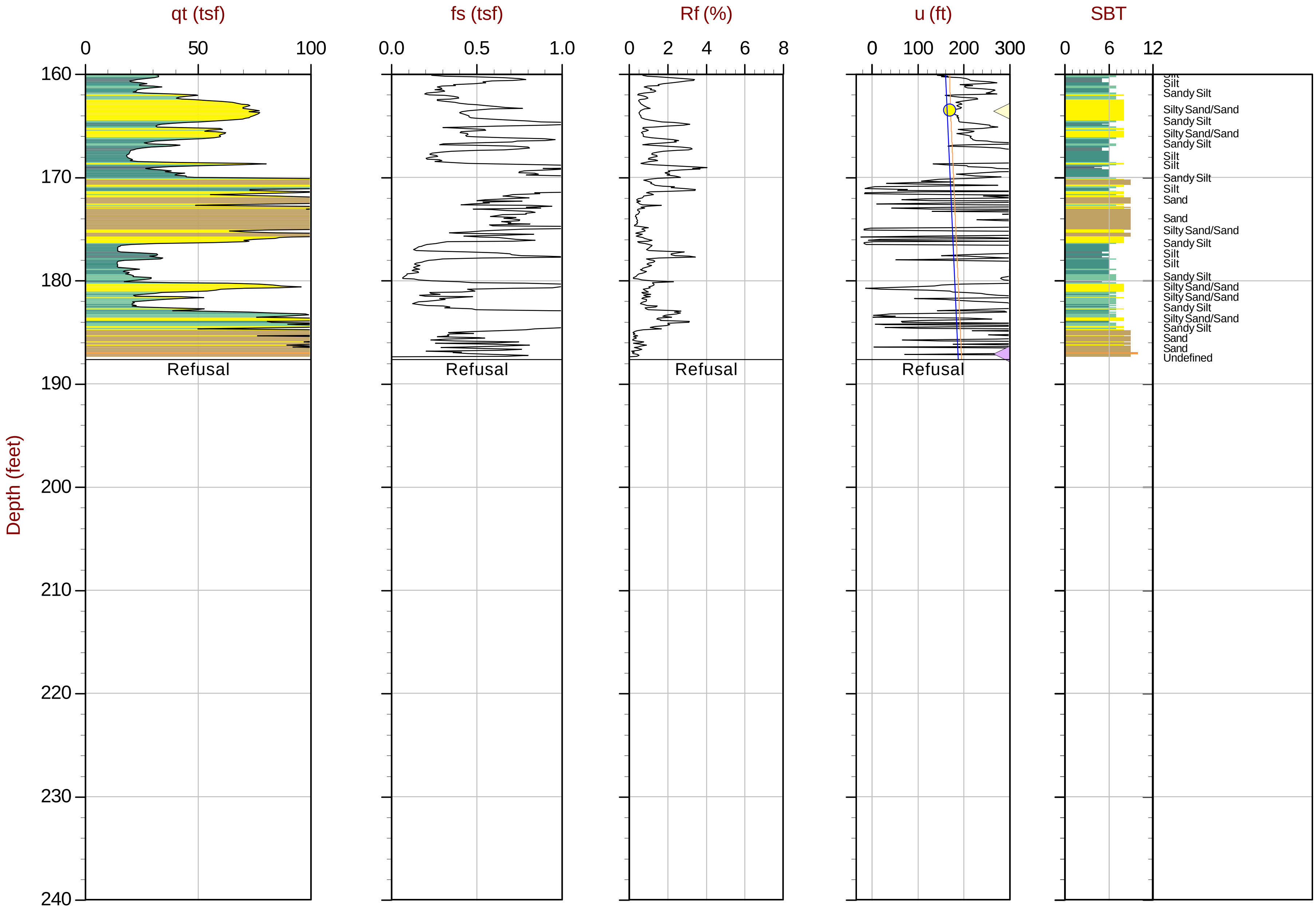
File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 2 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF
Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 3 of 3

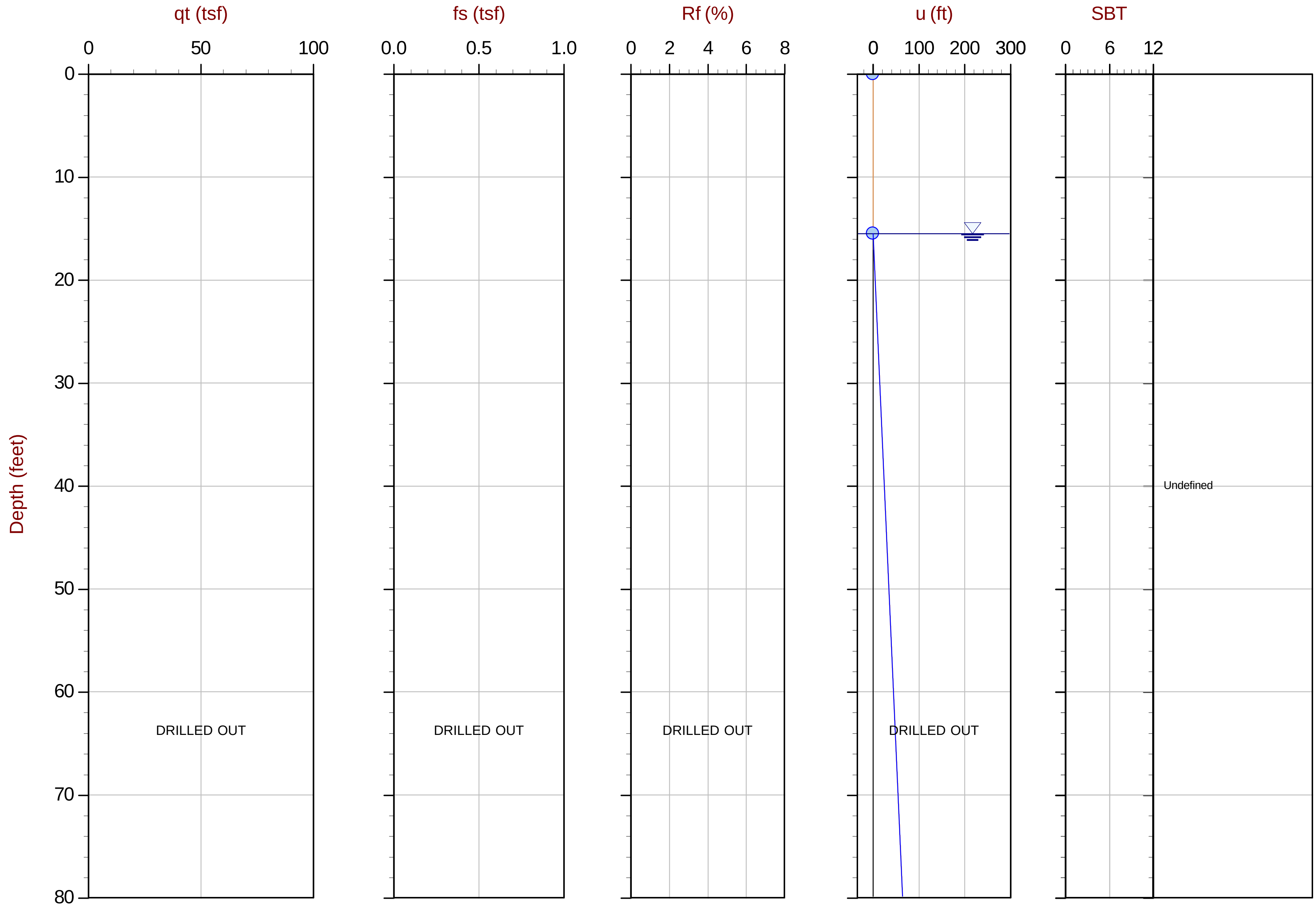
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



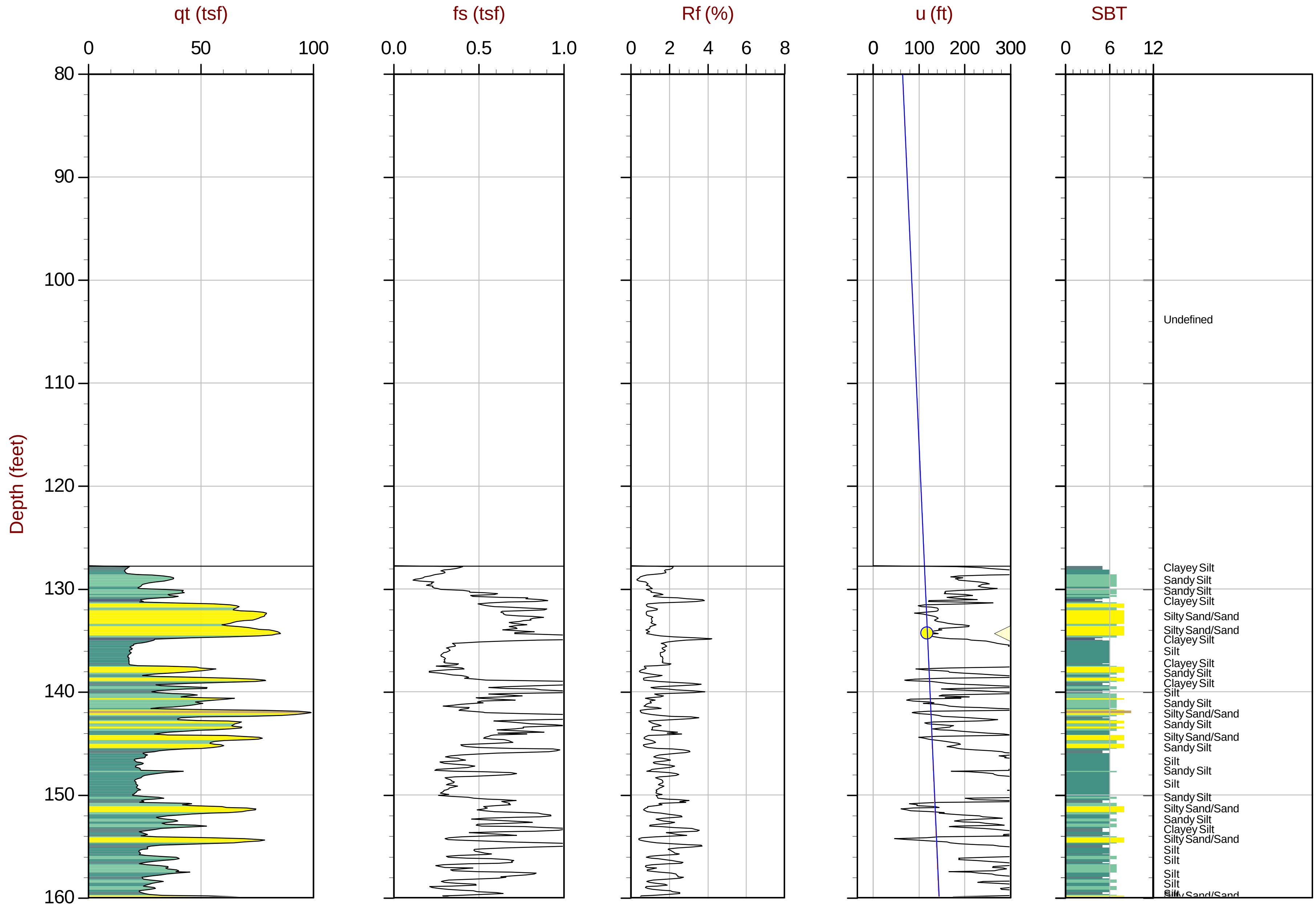
Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 1 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining	Job No: 17-51001	Sounding: SCPT17-32
	Date: 03:10:17 02:51	Cone: 473:T1500F15U1K
	Site: Fort Knox TSF	



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 2 of 3

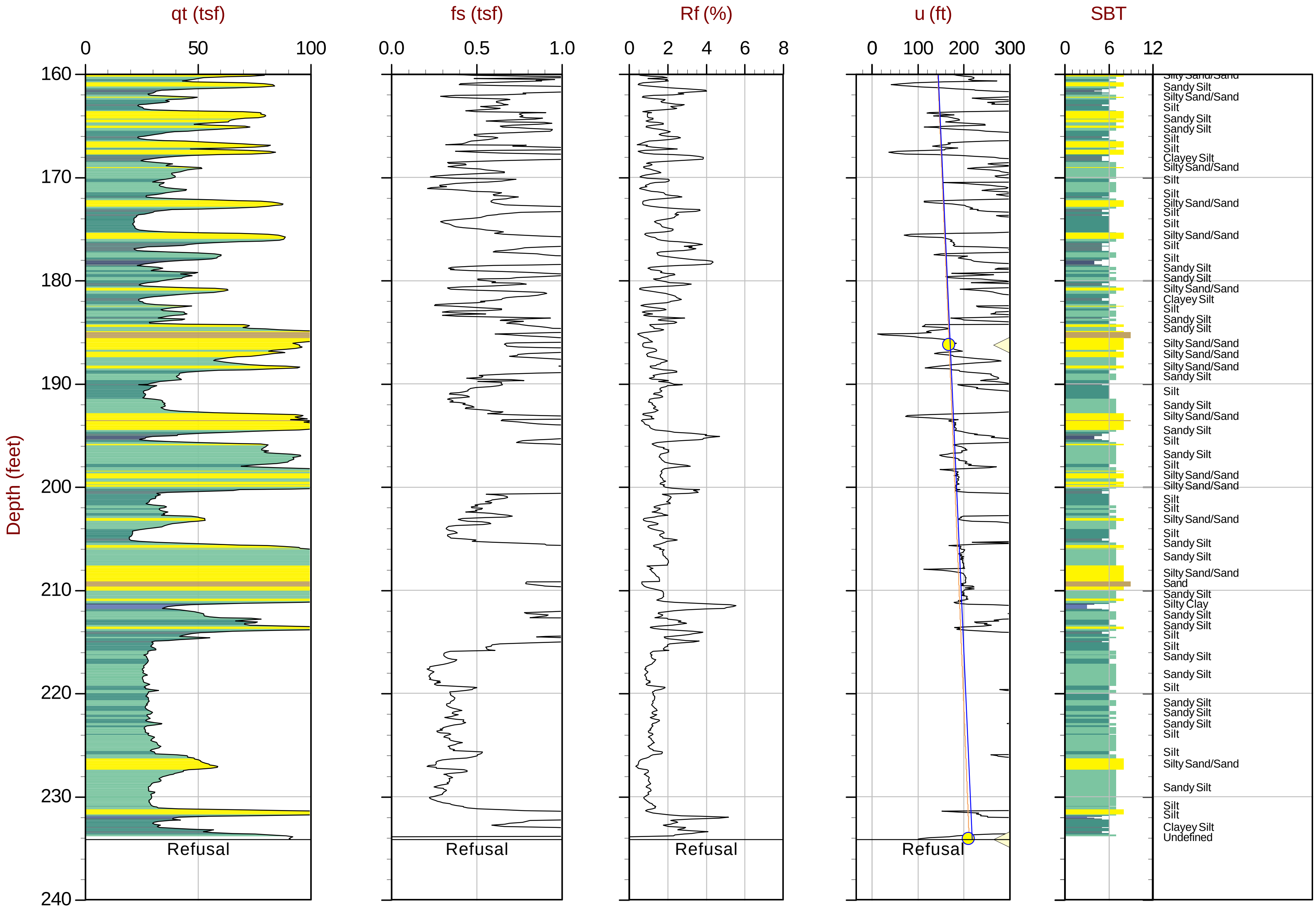
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 3 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

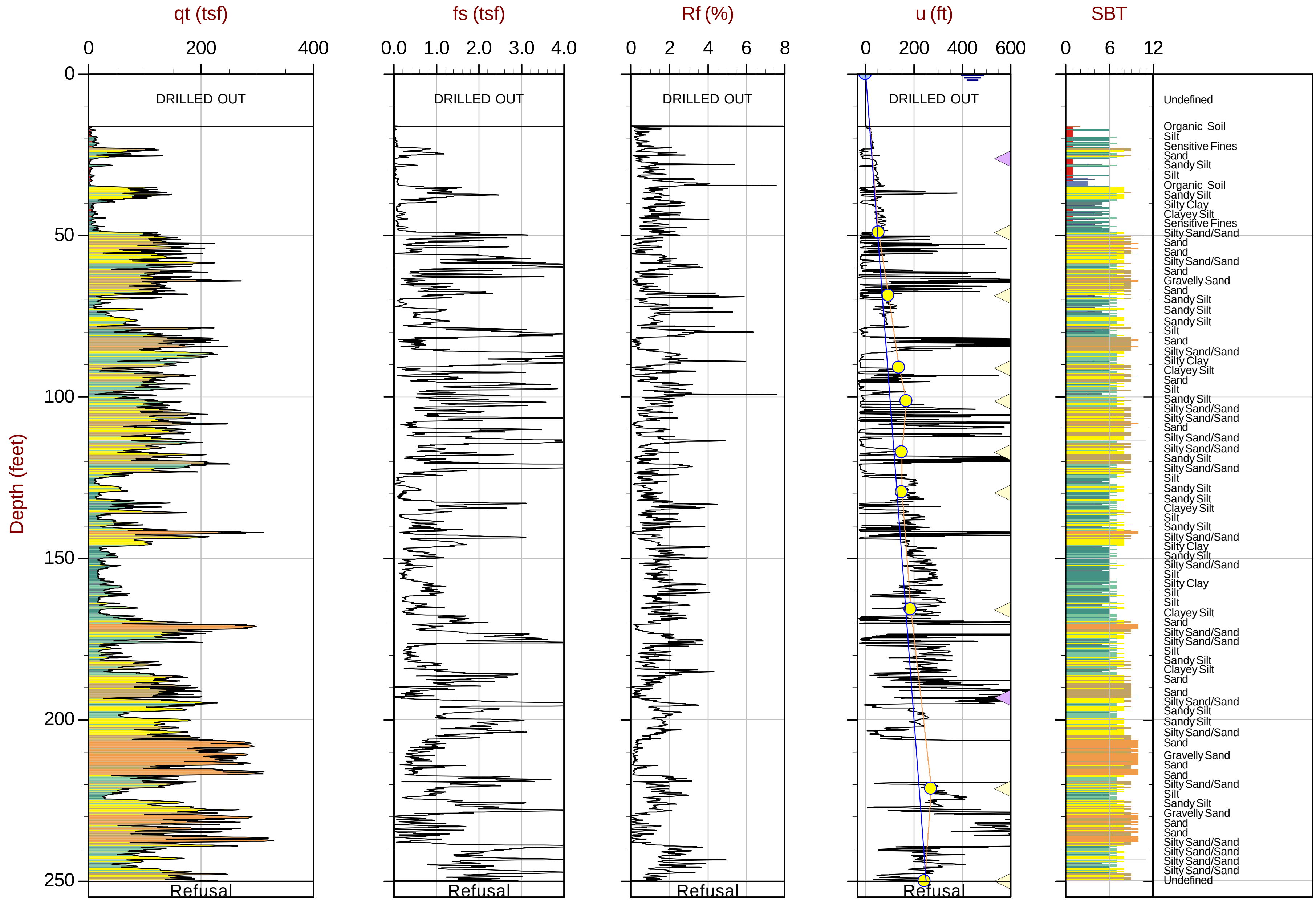
Cone Penetration Test Single Page Plots

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 1 of 1

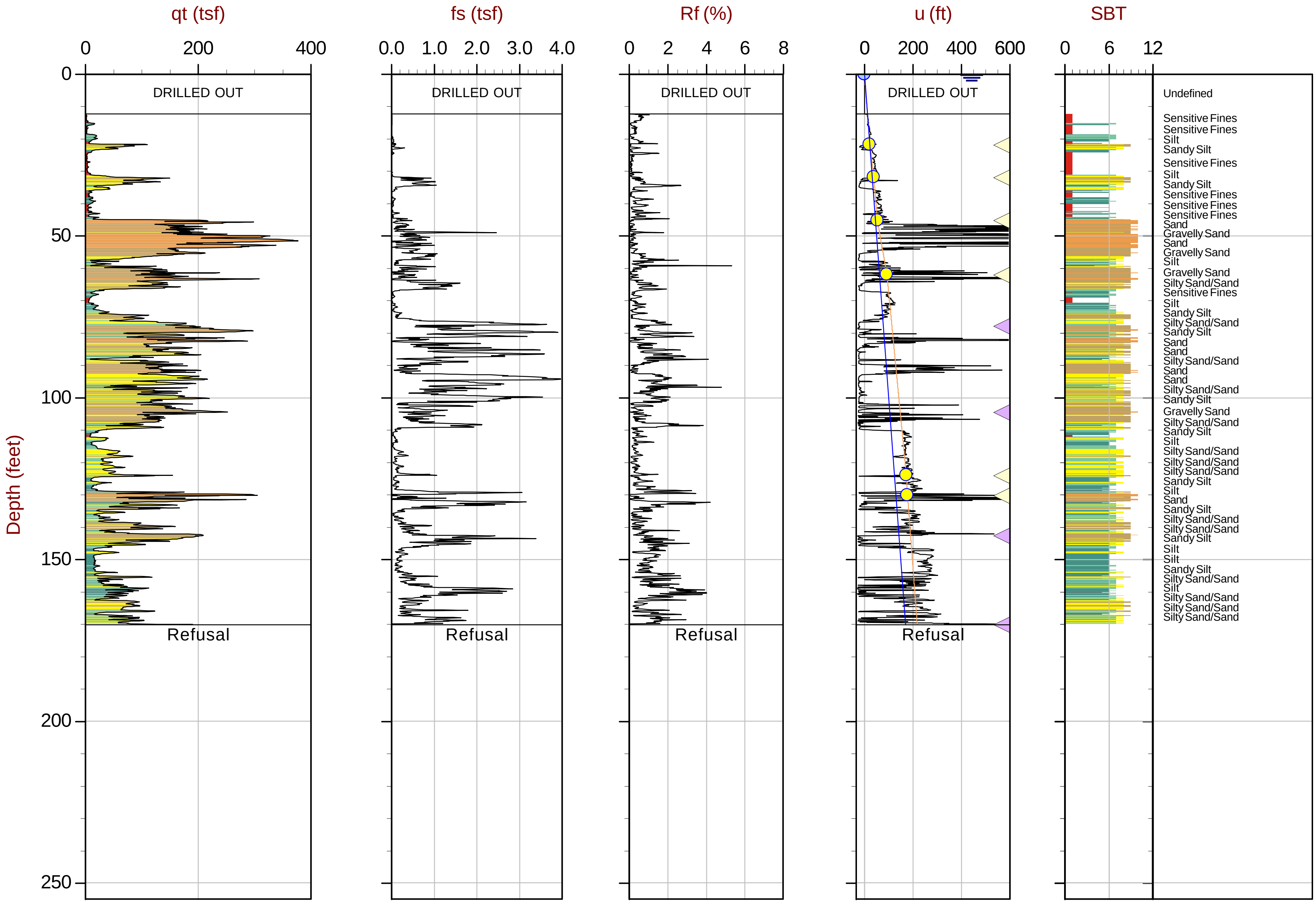
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 1 of 1

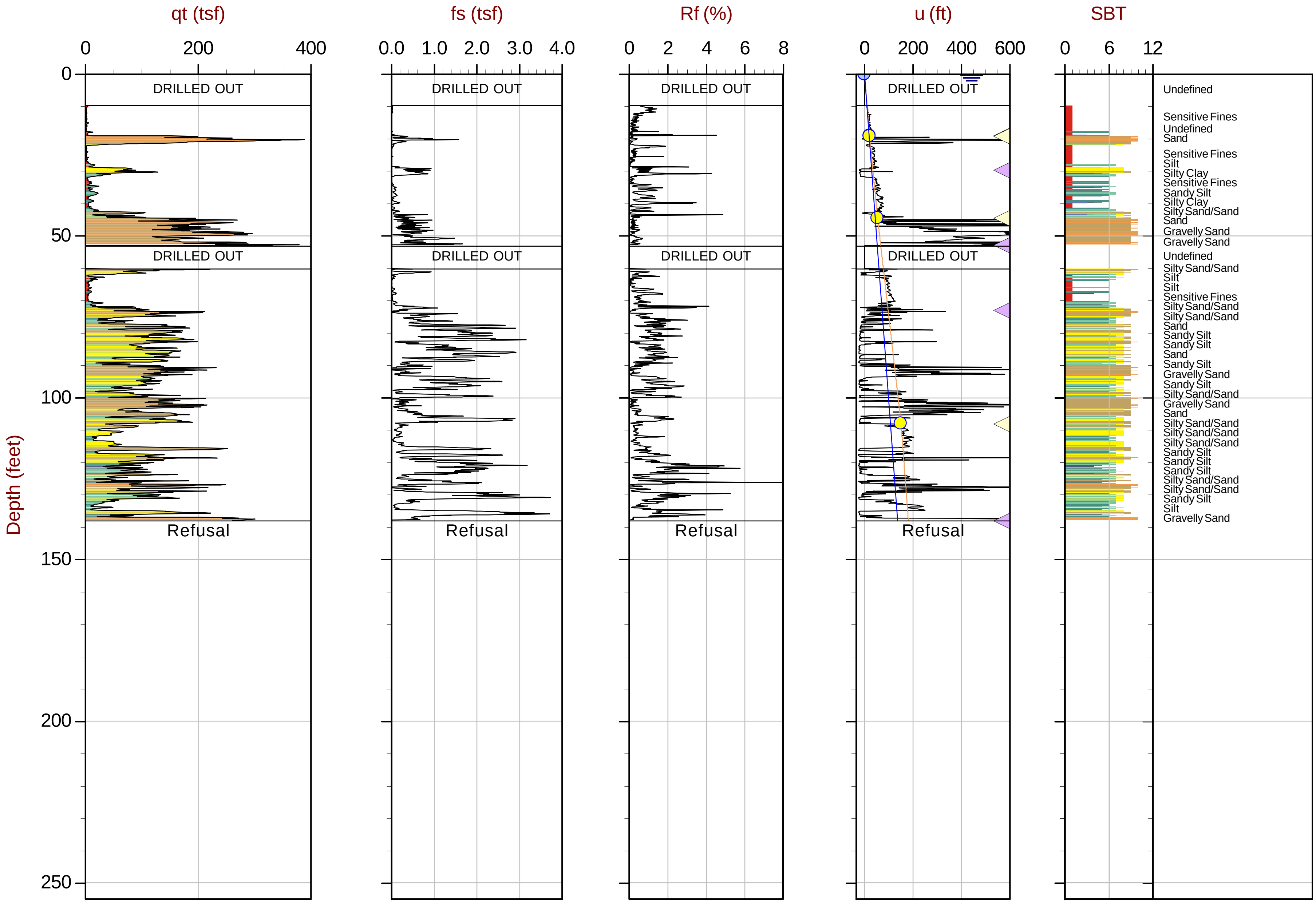
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 1 of 1

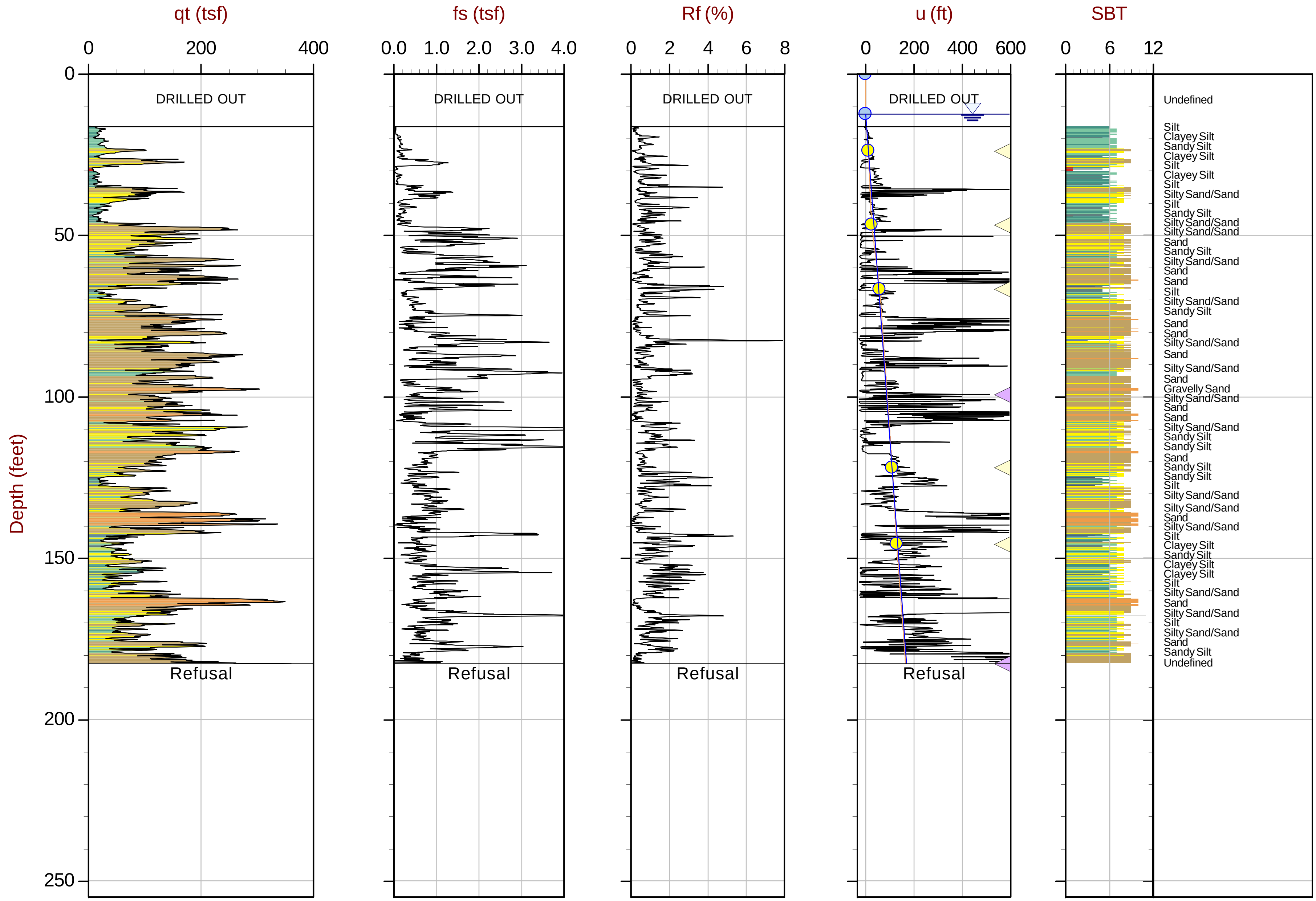
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 1 of 1

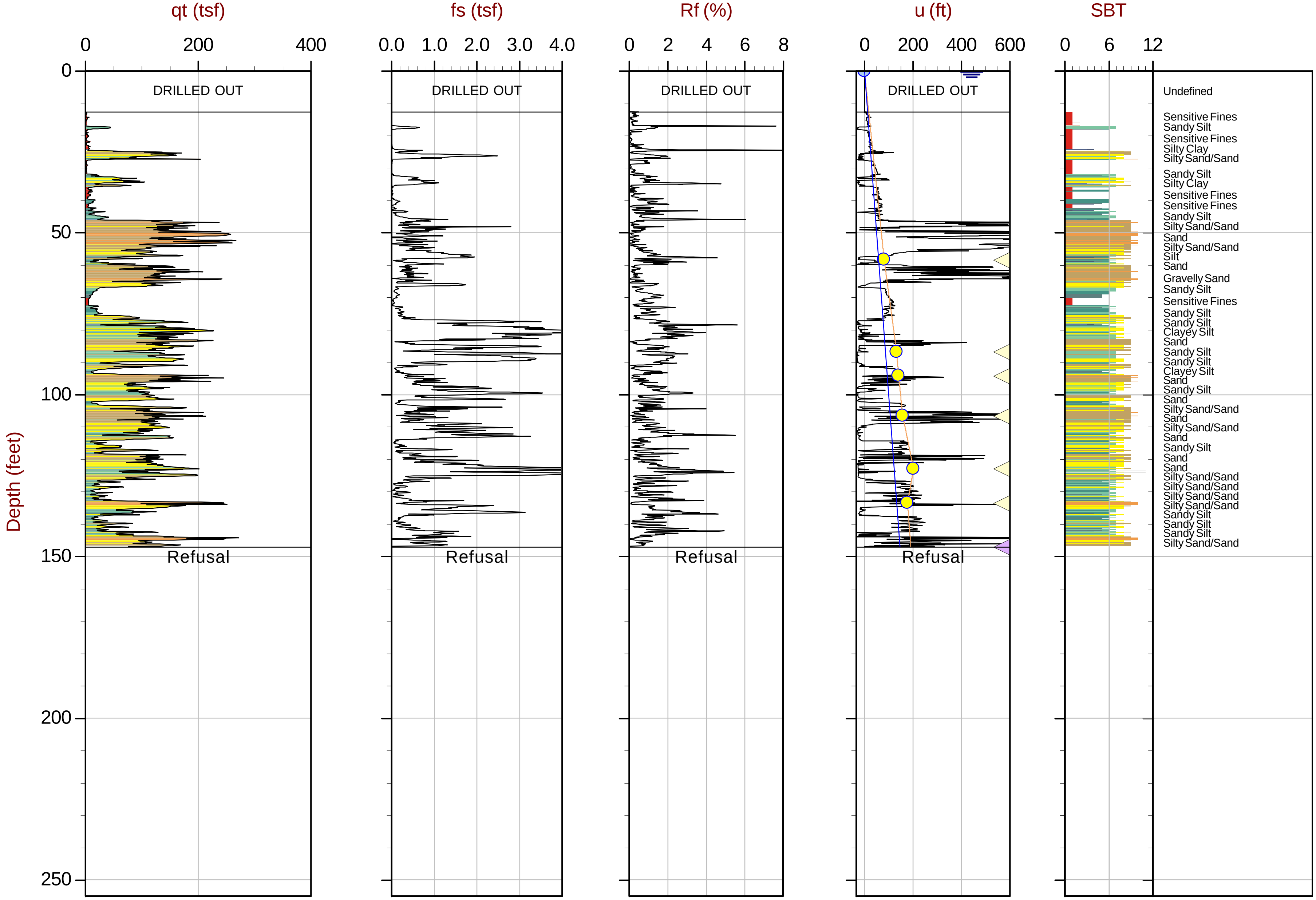
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 1 of 1

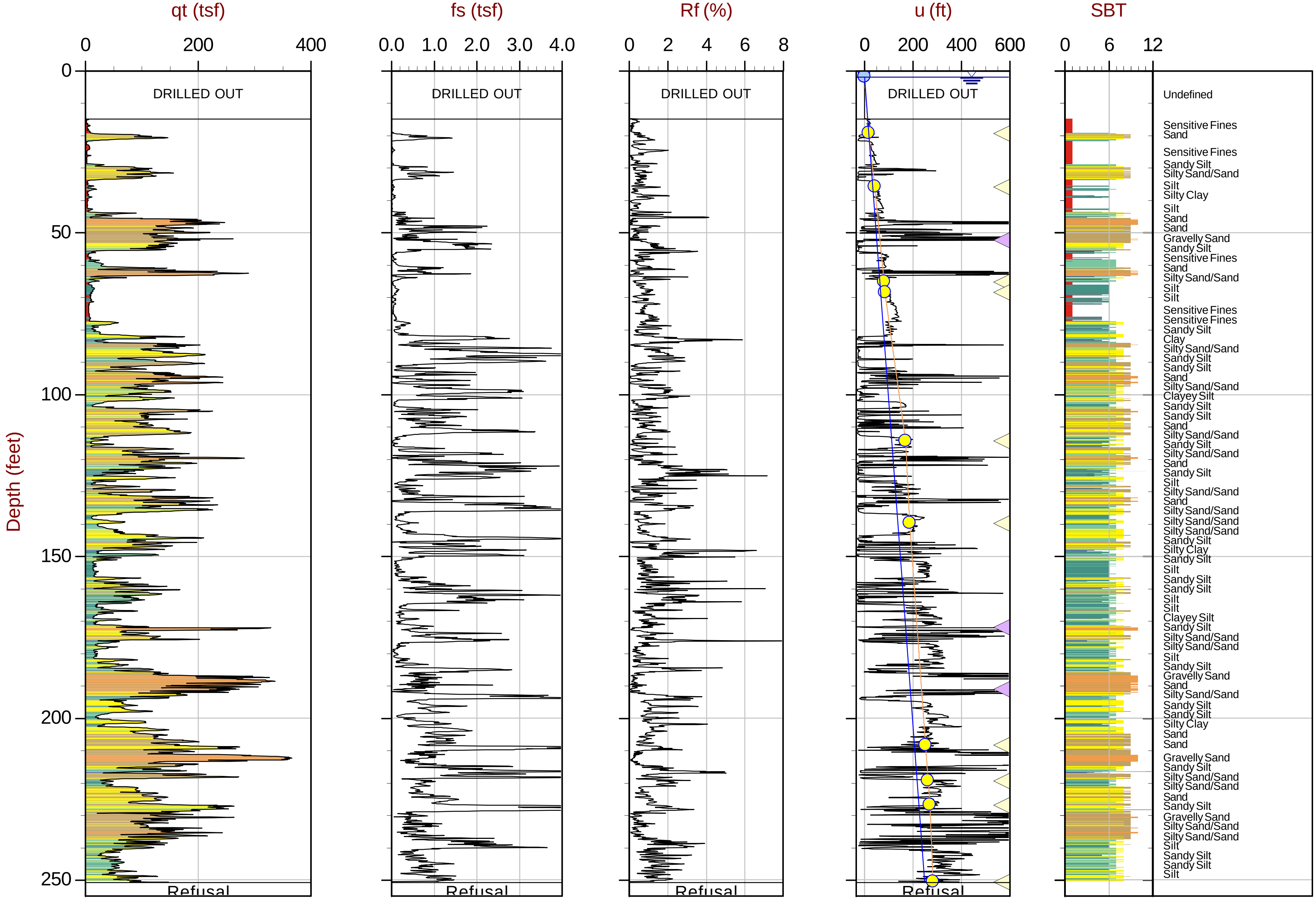
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 1 of 1

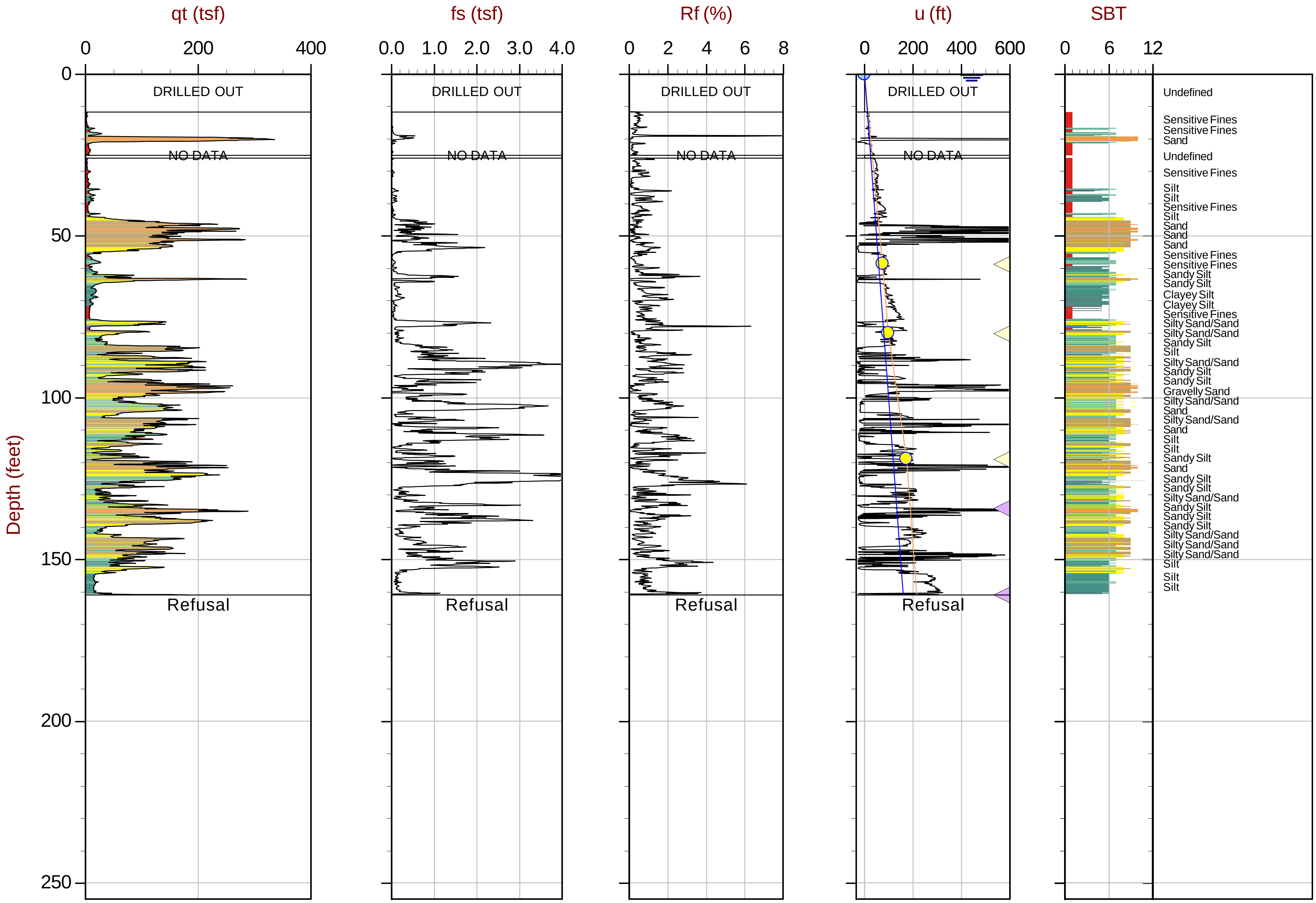
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 1 of 1

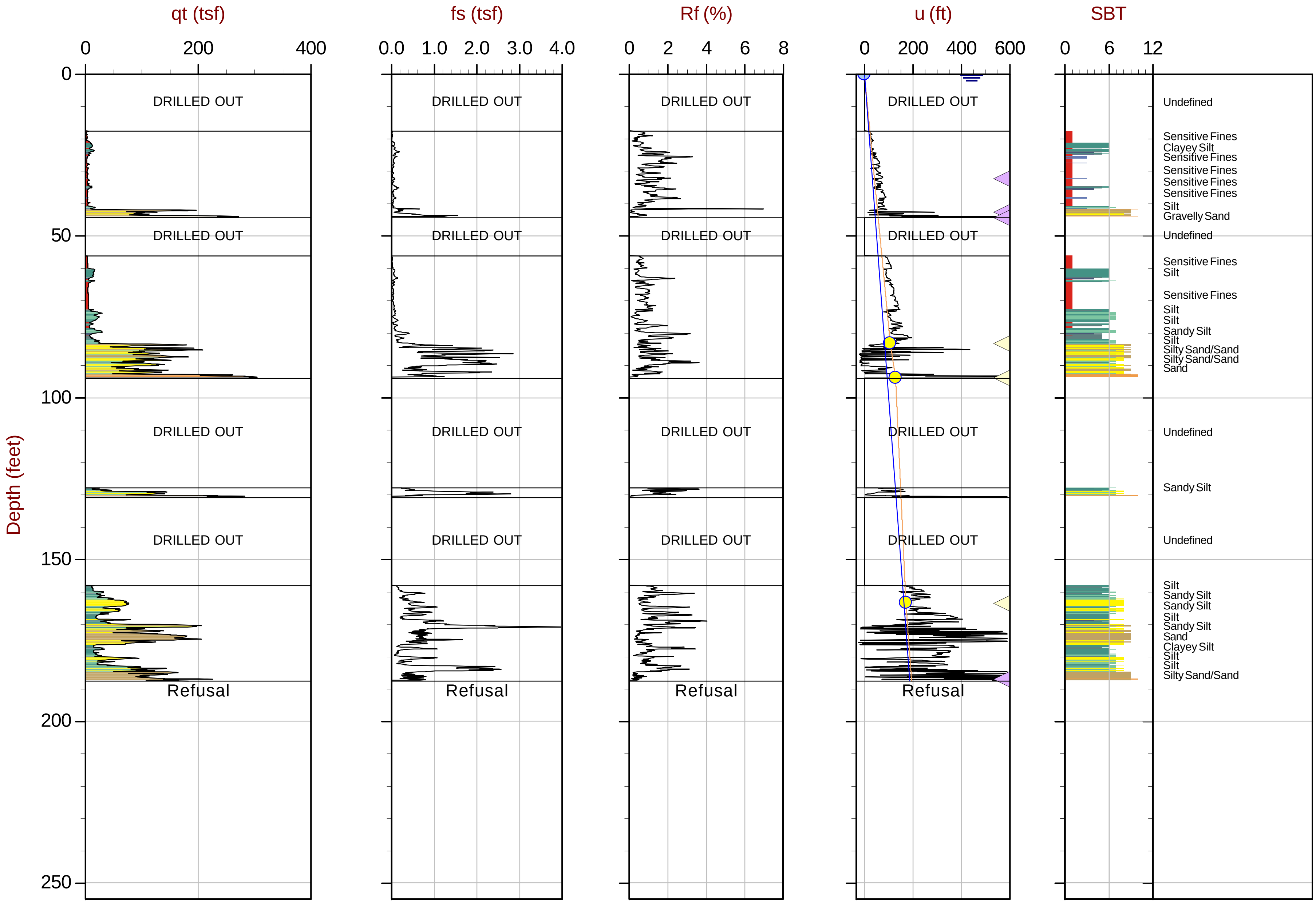
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

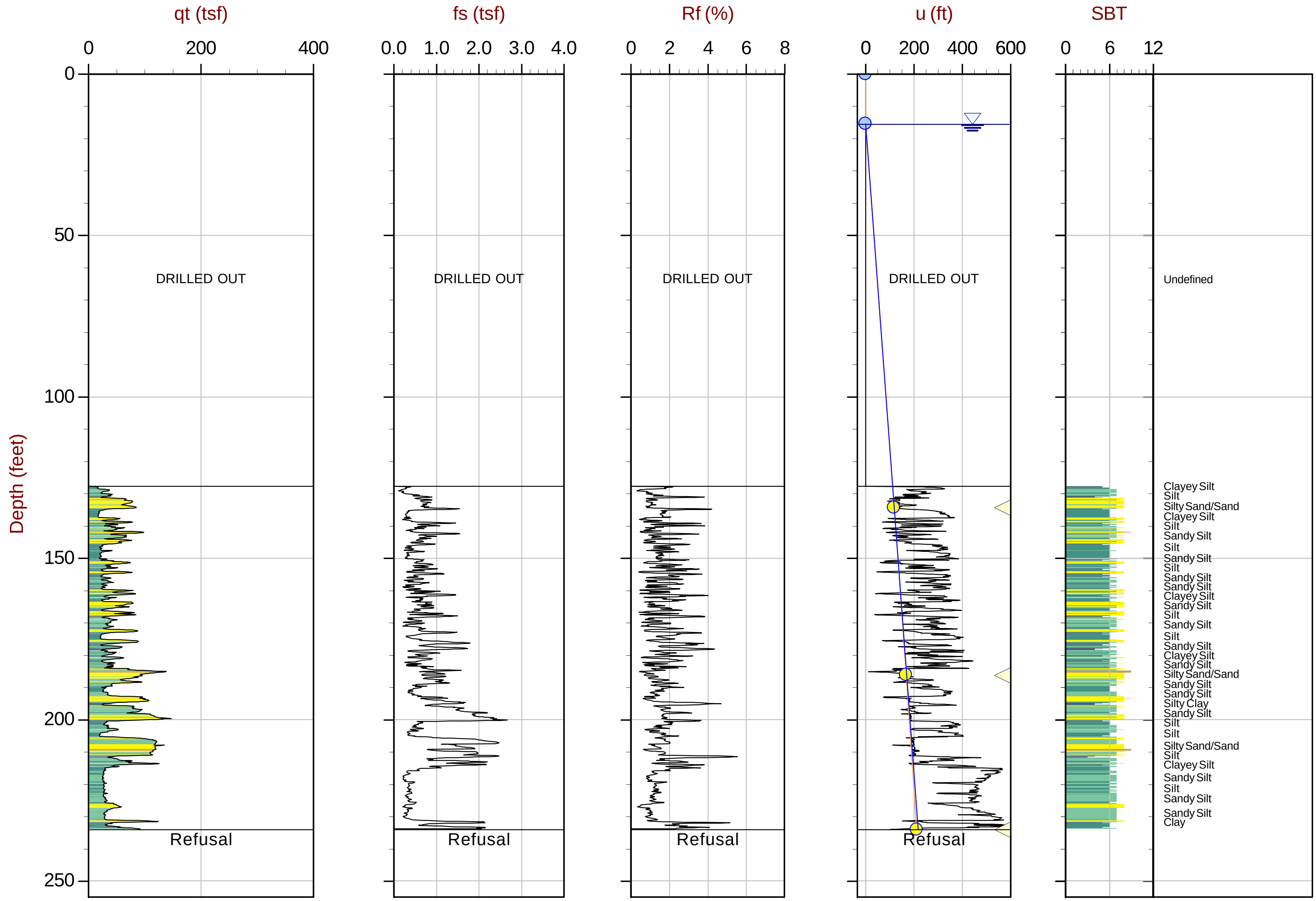
File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 1 of 1

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF
Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 1 of 1

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

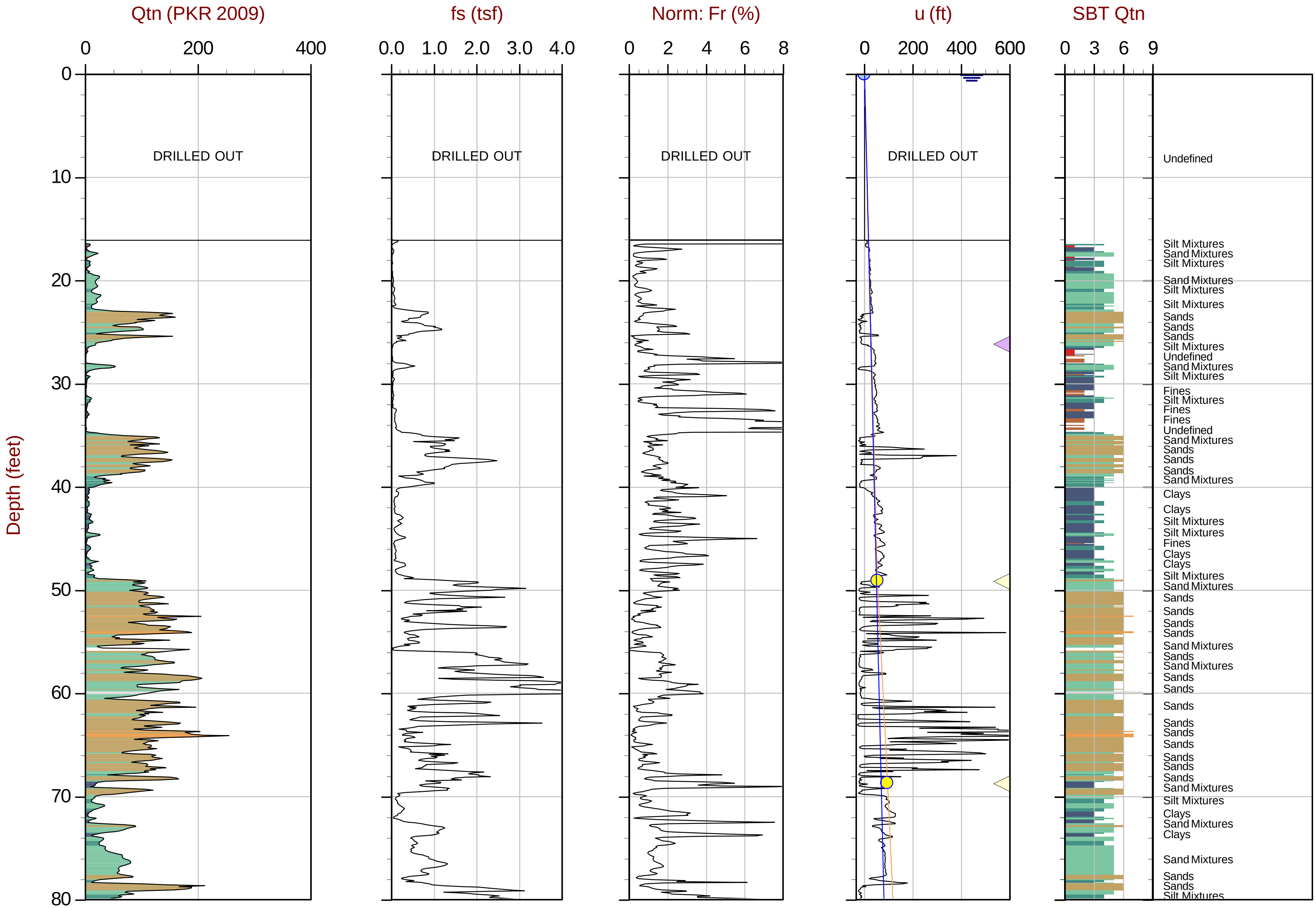
Cone Penetration Test Normalized Plots

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 1 of 4

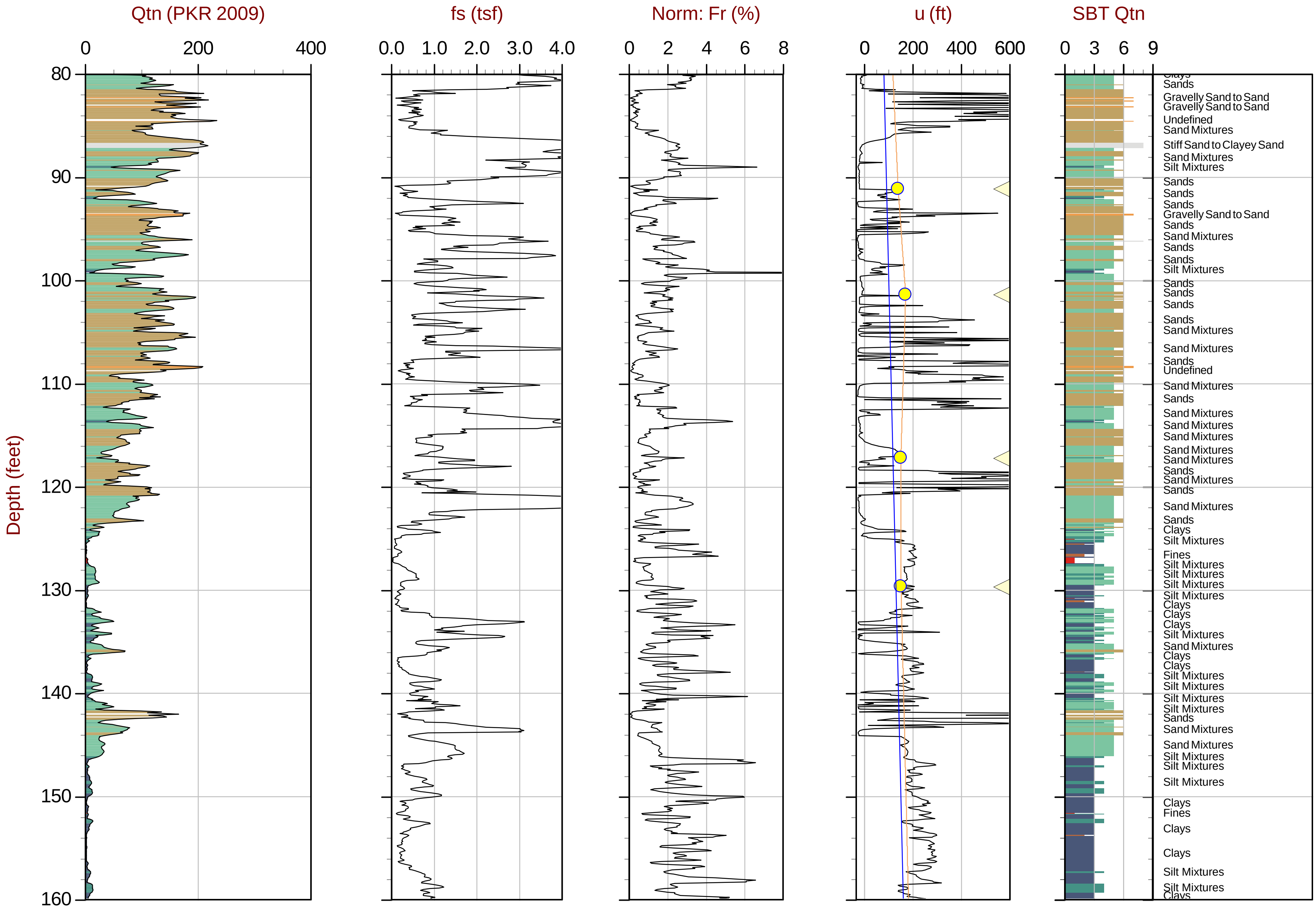
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 2 of 4

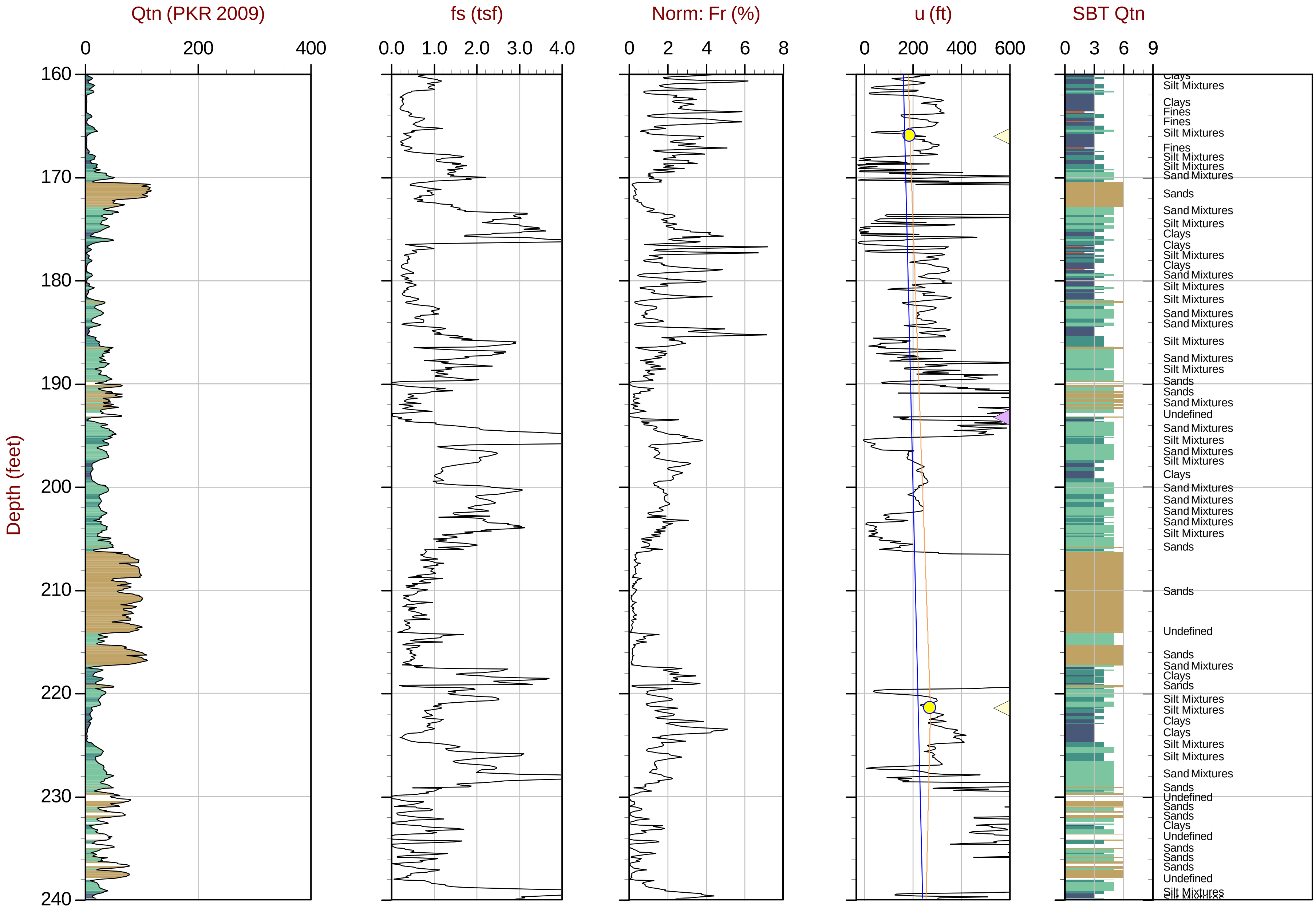
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 3 of 4

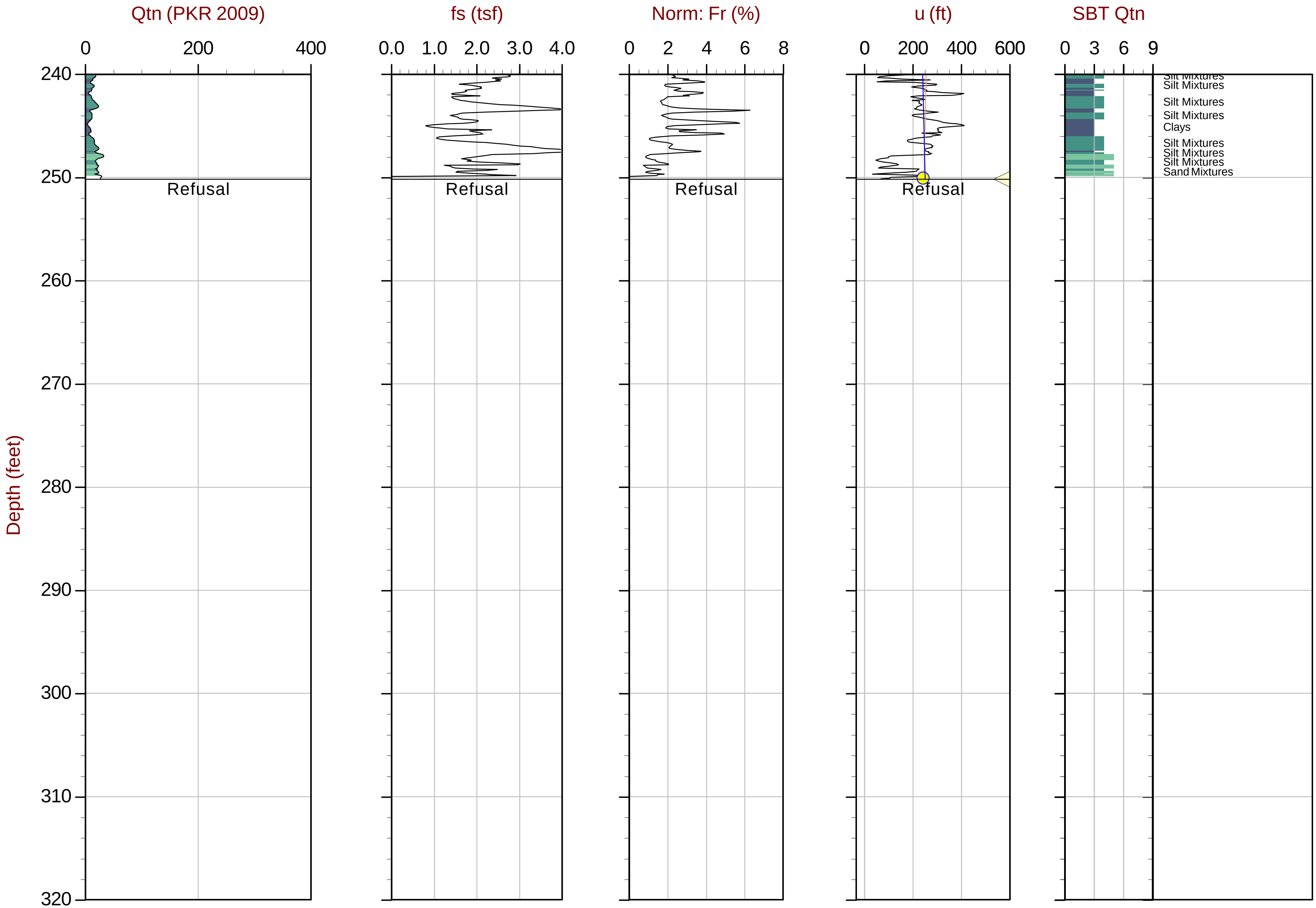
Overplot Item: Assumed Ueq | Ueq | Dissipation, equilibrium achieved | Dissipation, equilibrium not achieved | Equilibrium profile | Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208450m E: 484415m

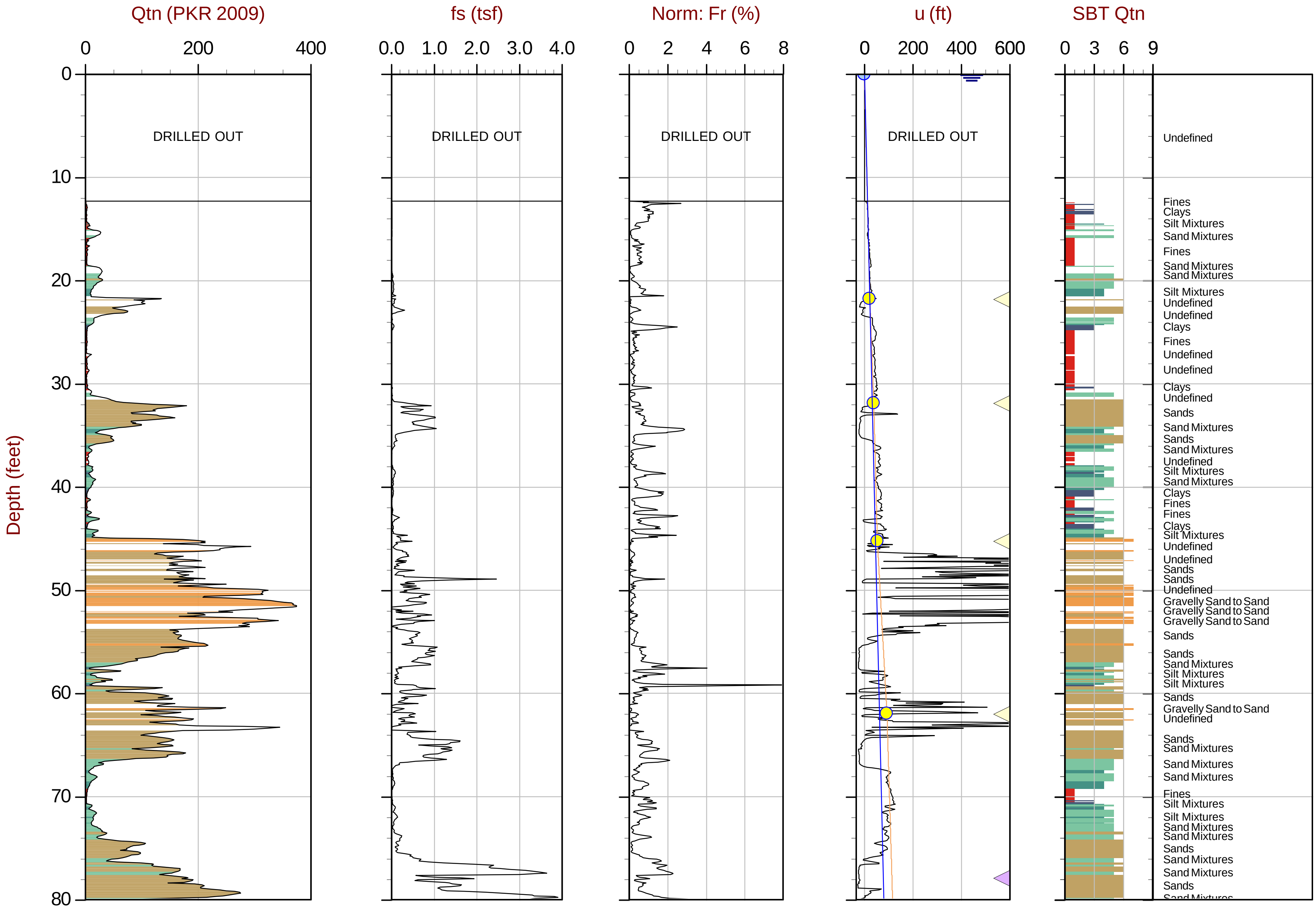
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

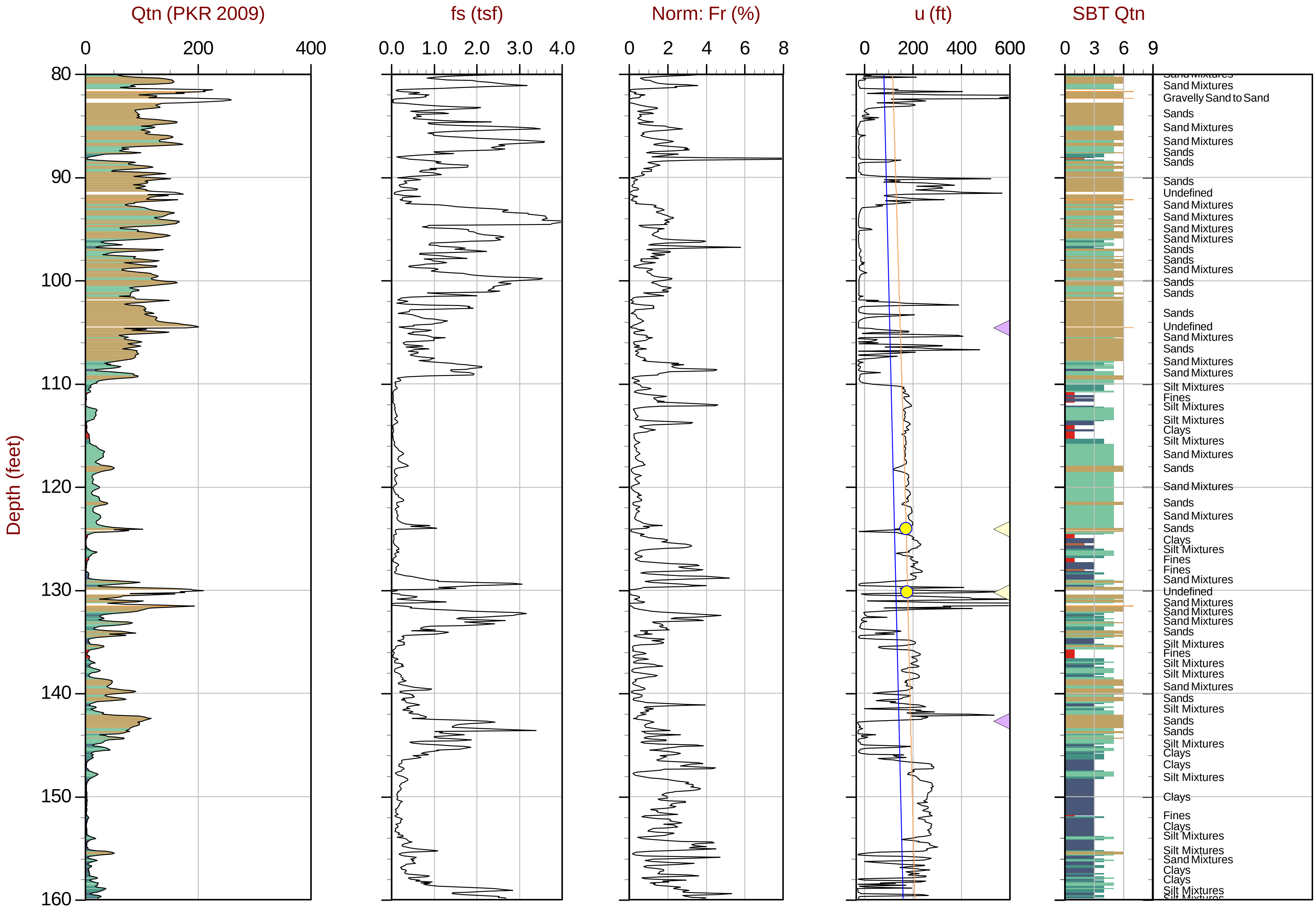
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 1 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

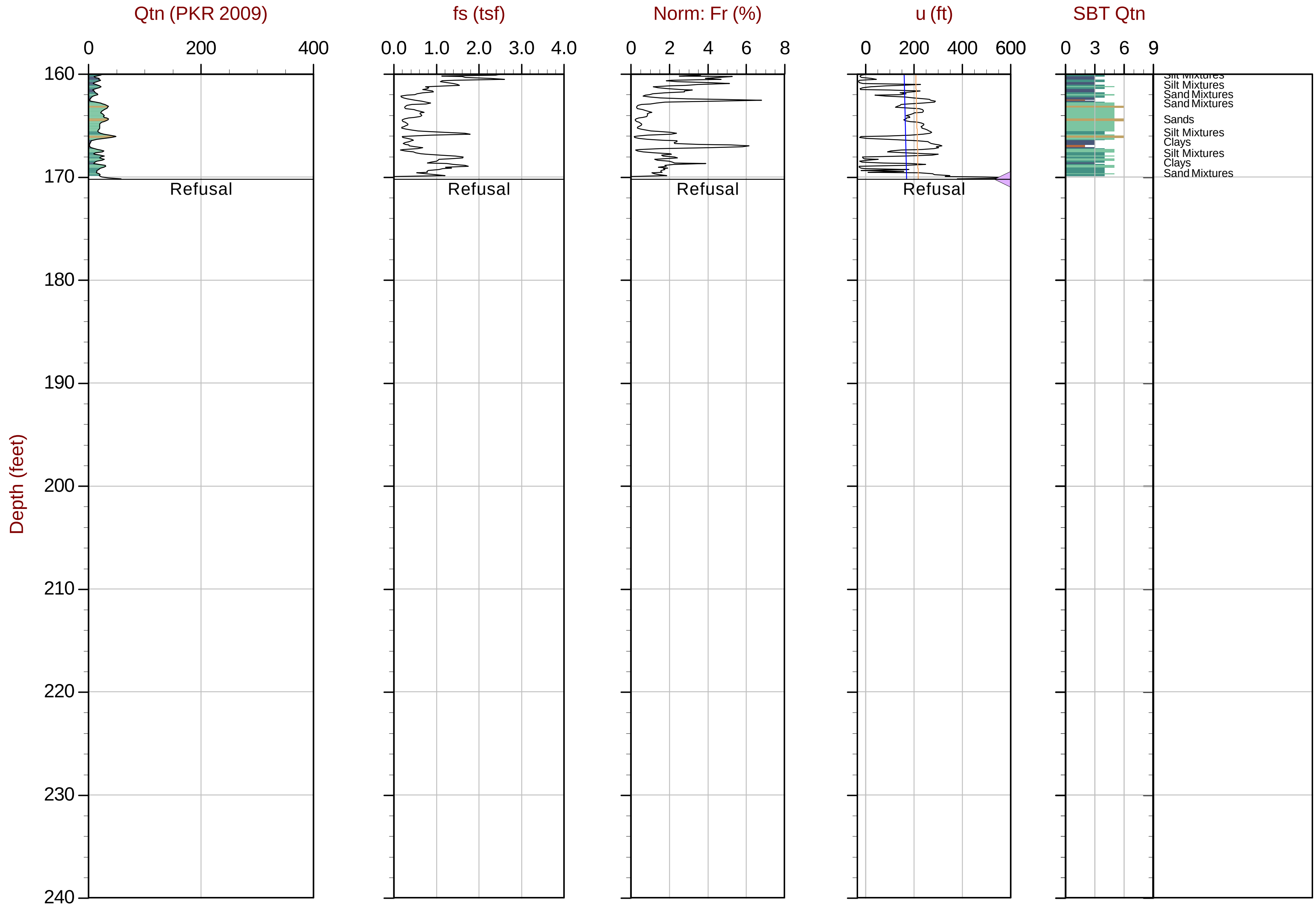
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 2 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 3 of 3

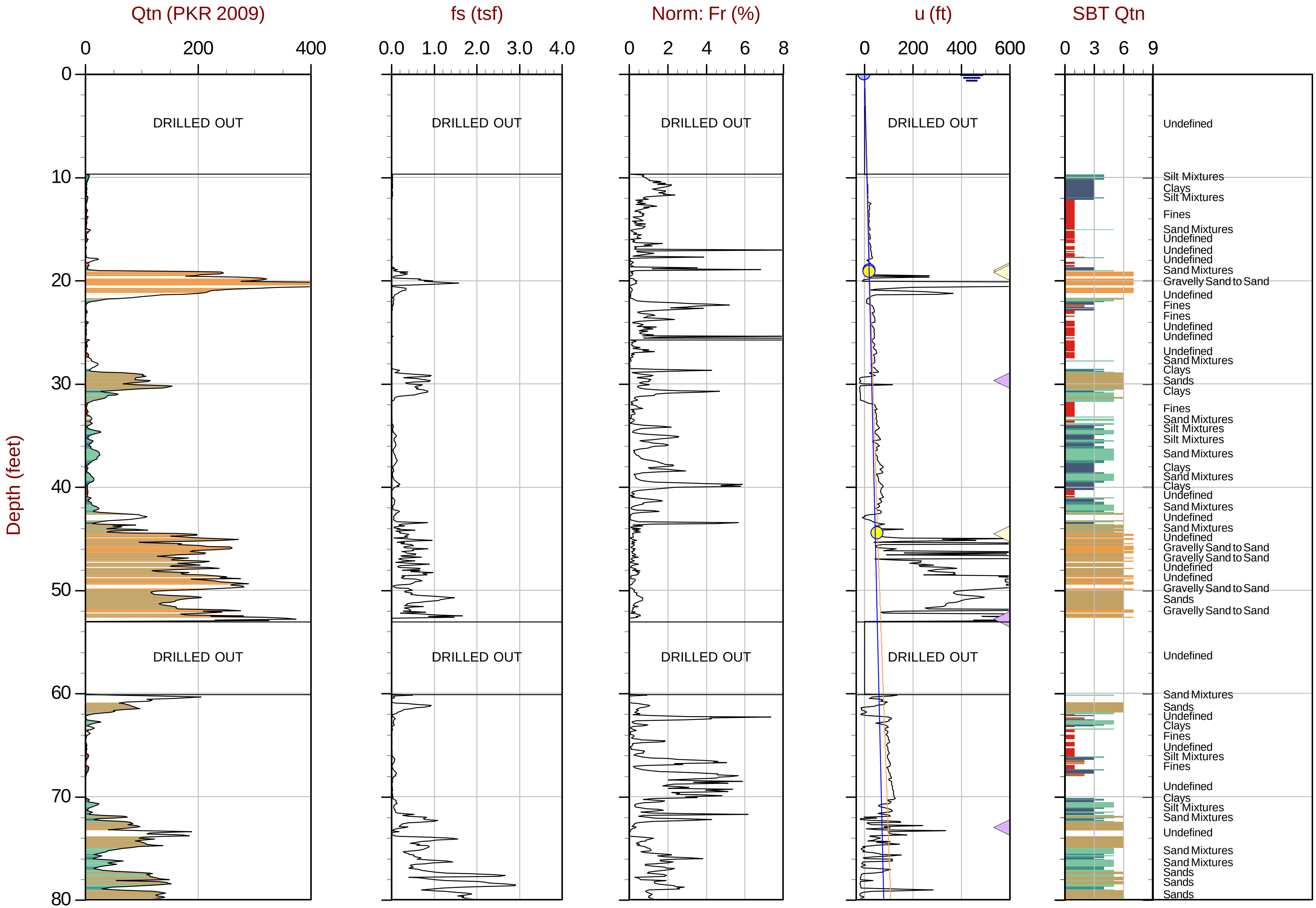
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones

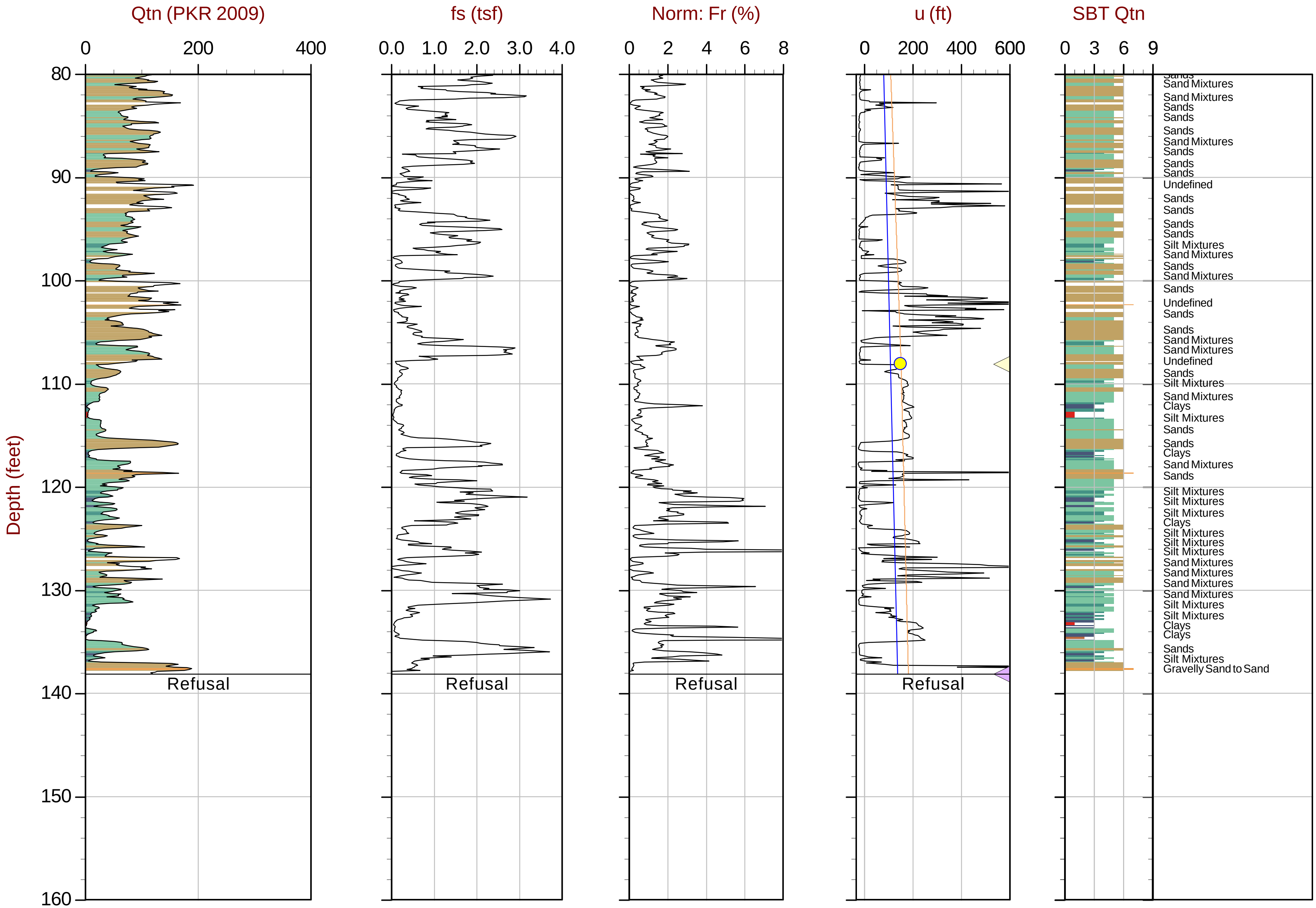
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 1 of 2

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF
Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208684m E: 484807m

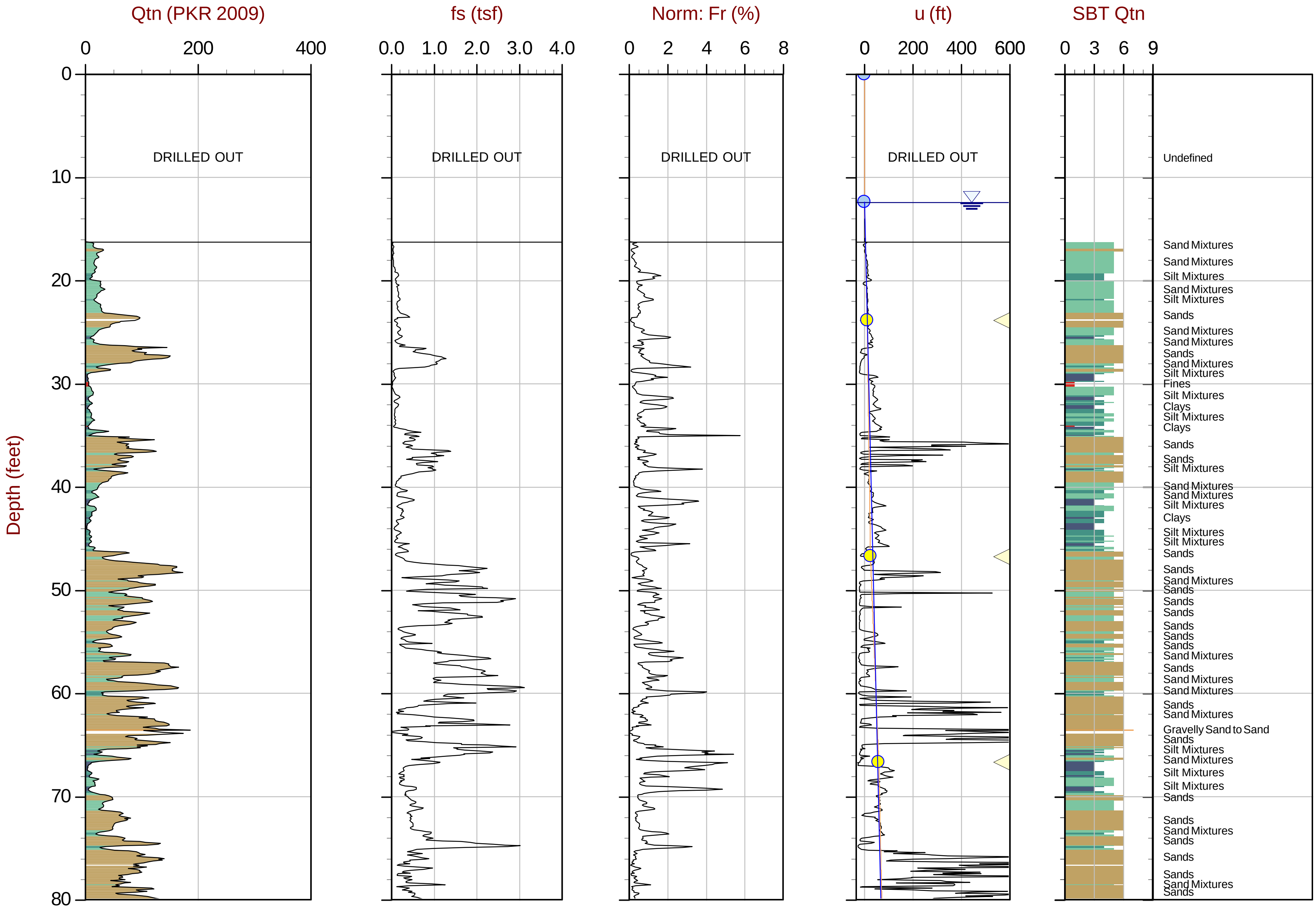
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 1 of 3

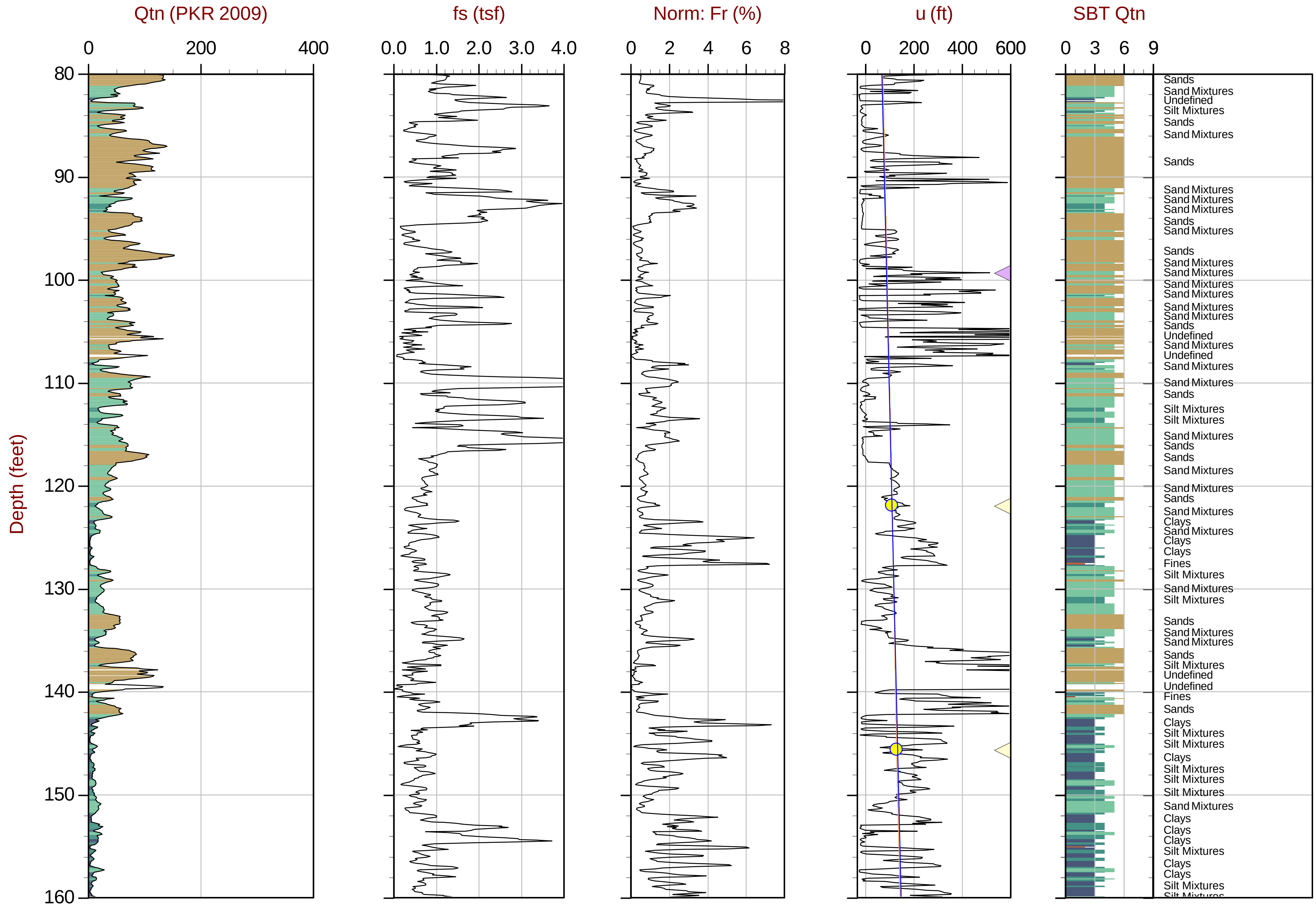
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 2 of 3

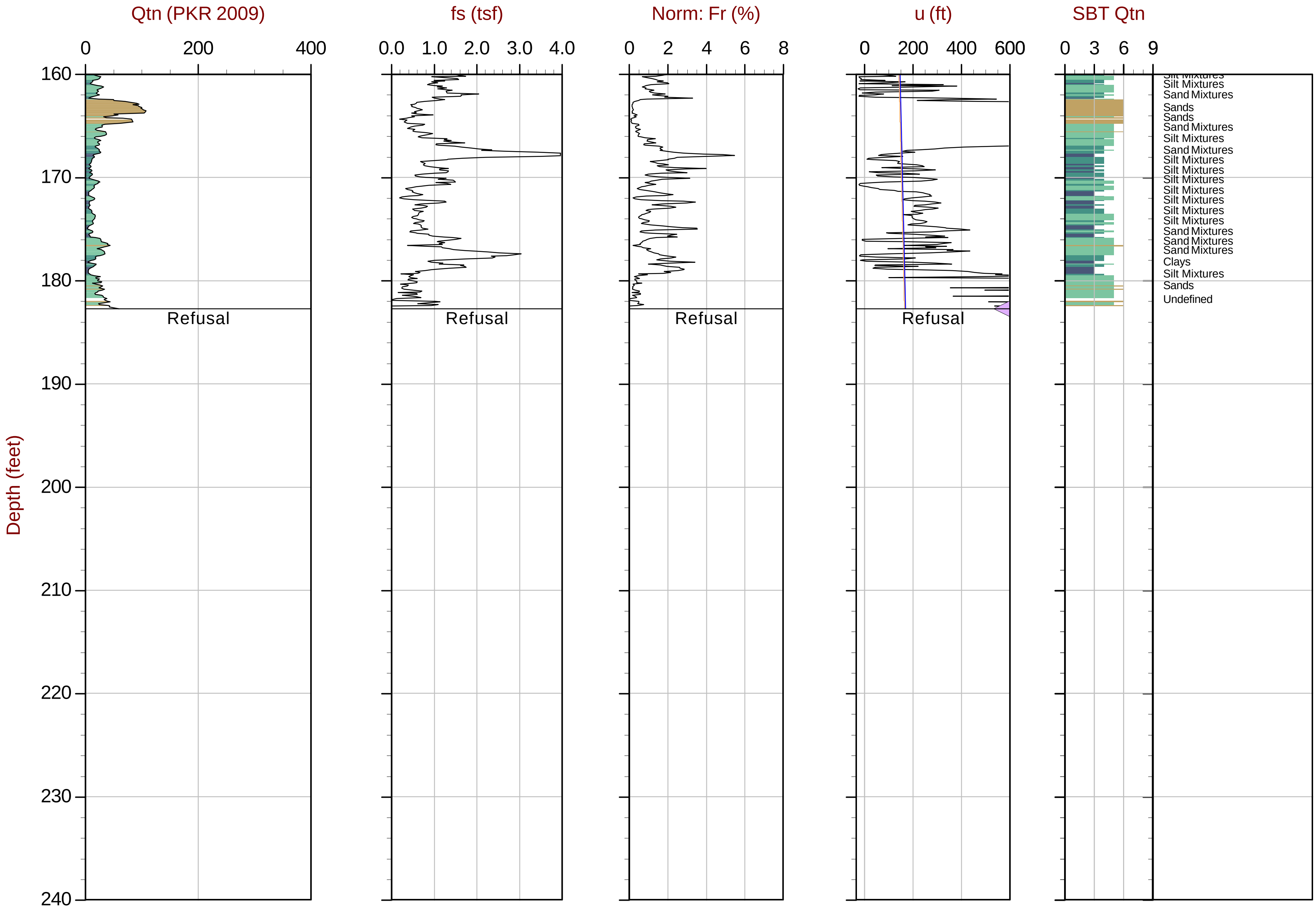
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
File: 17-51001_SP26.COR
Unit Wt: SBT Zones
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 3 of 3

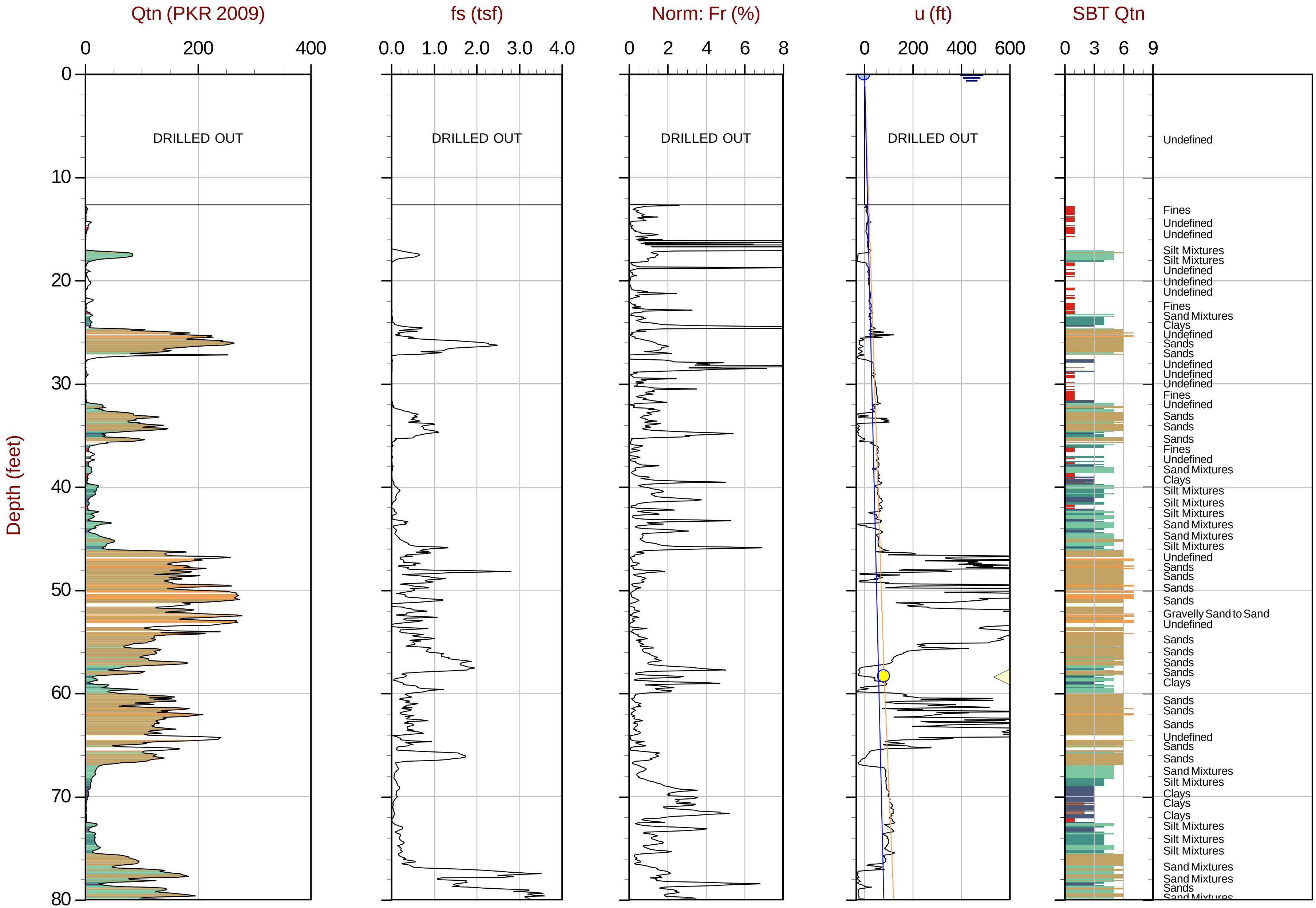
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 1 of 2

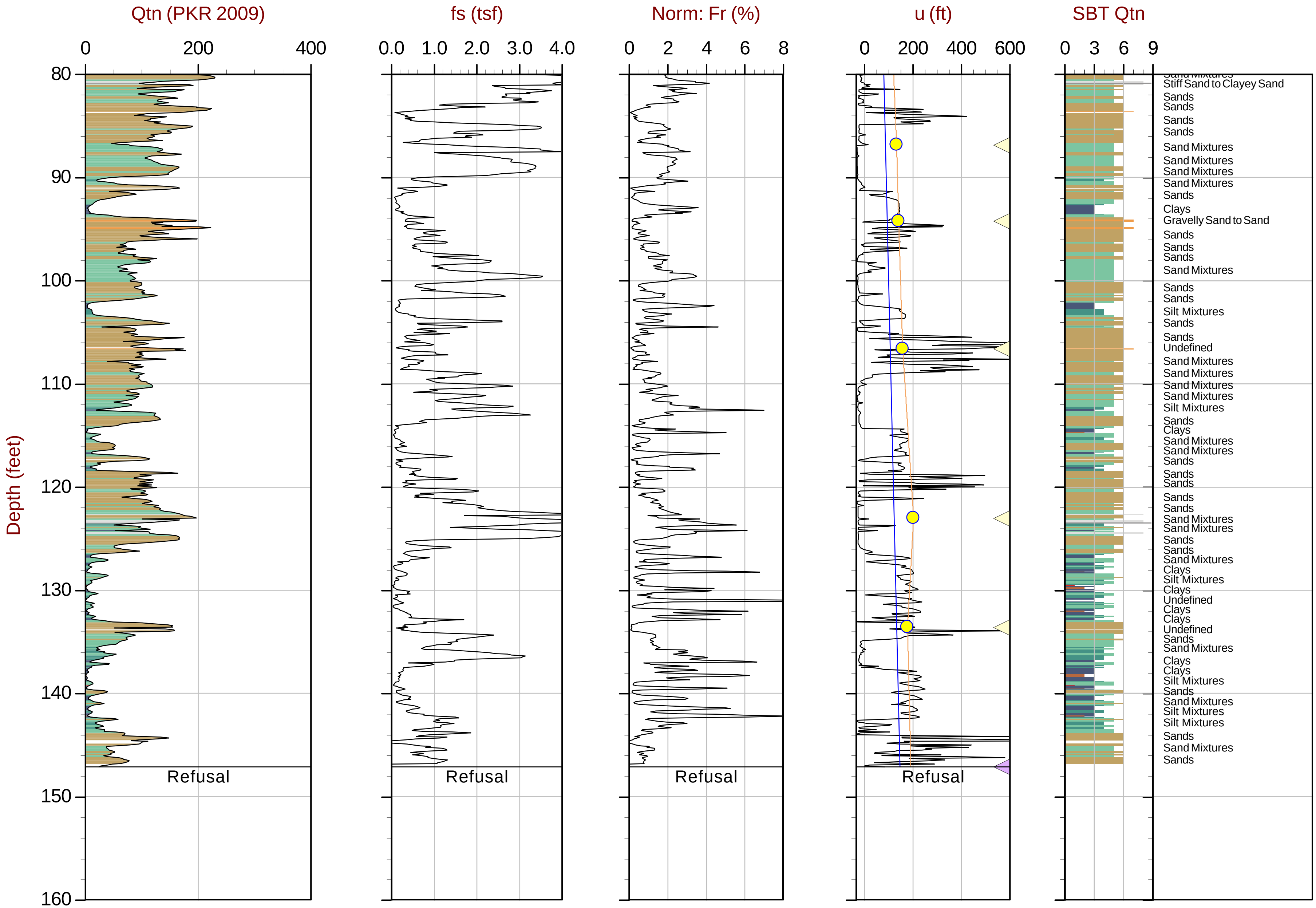
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 2 of 2

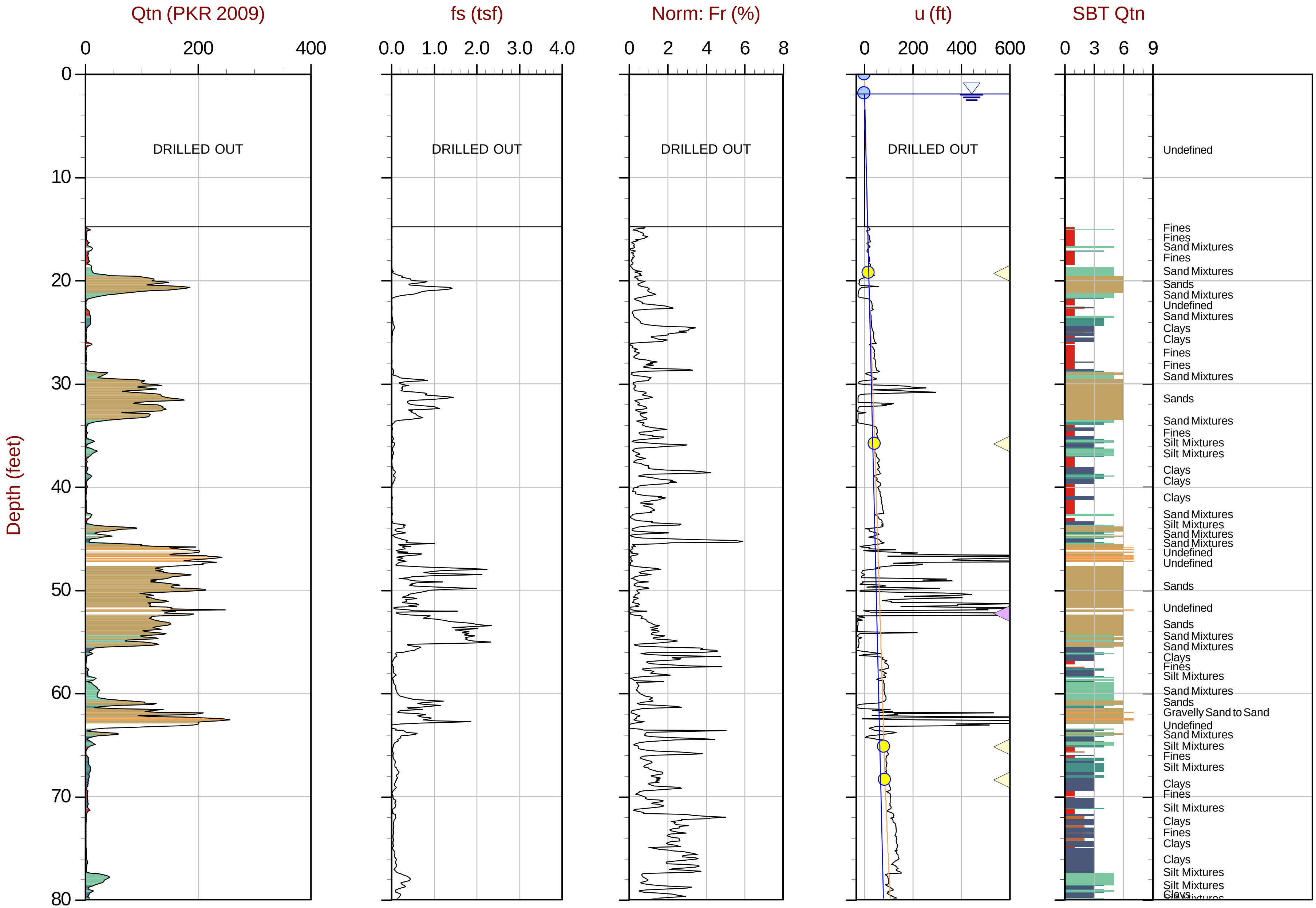
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 1 of 4

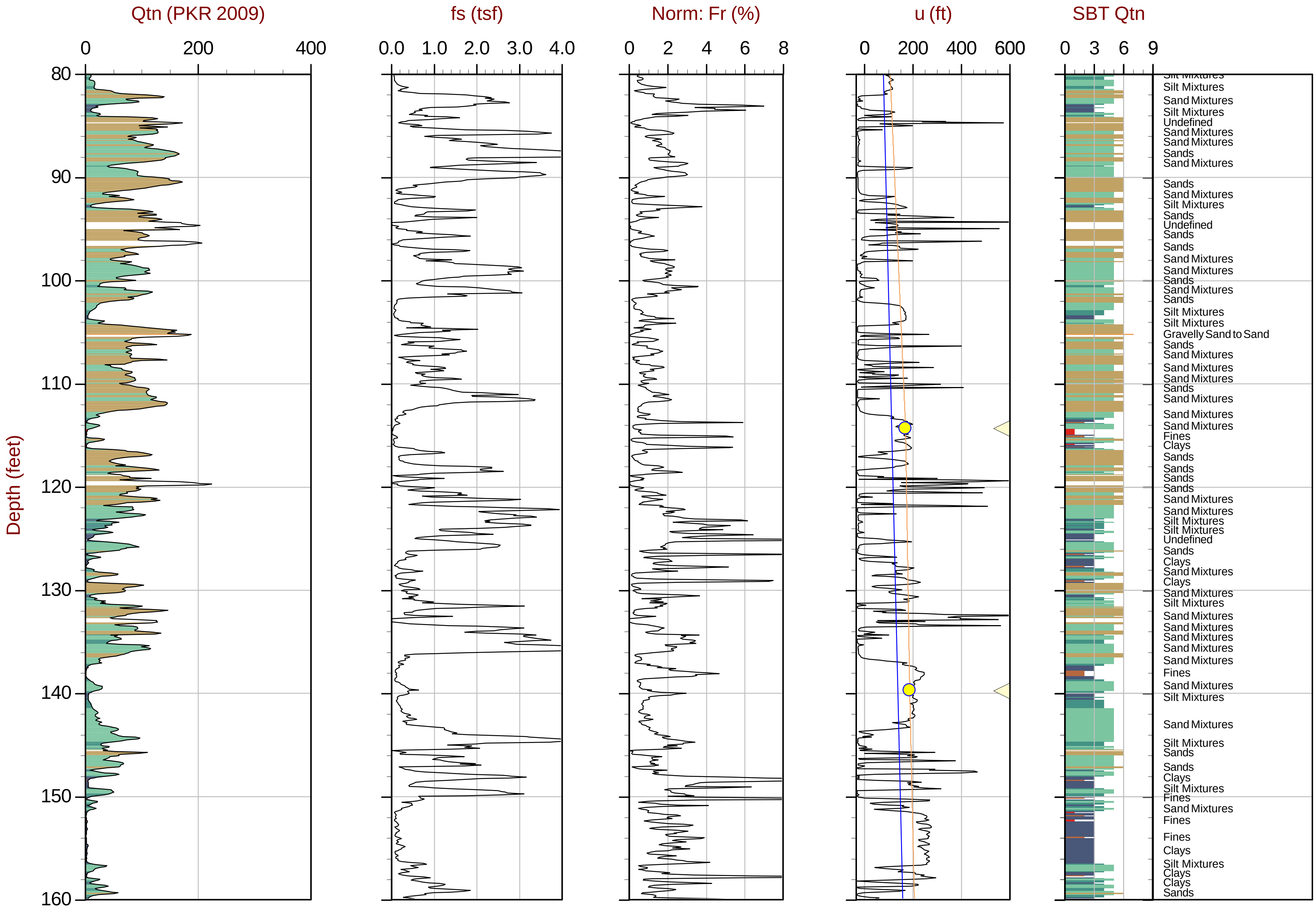
Overplot Item: ○ Assumed Ueq ● Ueq ◁ Dissipation, equilibrium achieved ◁ Dissipation, equilibrium not achieved — Equilibrium profile — Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

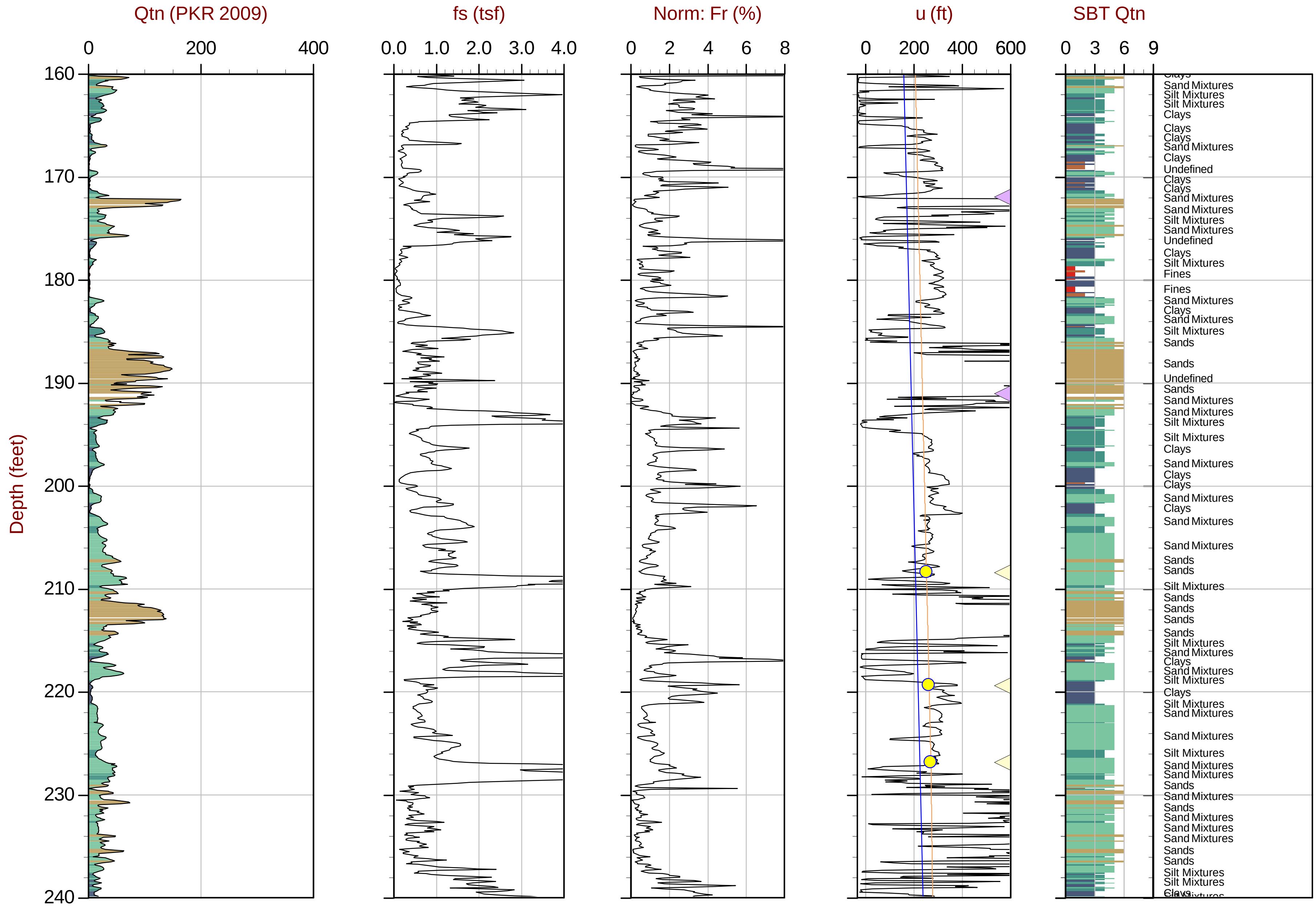
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 2 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 3 of 4

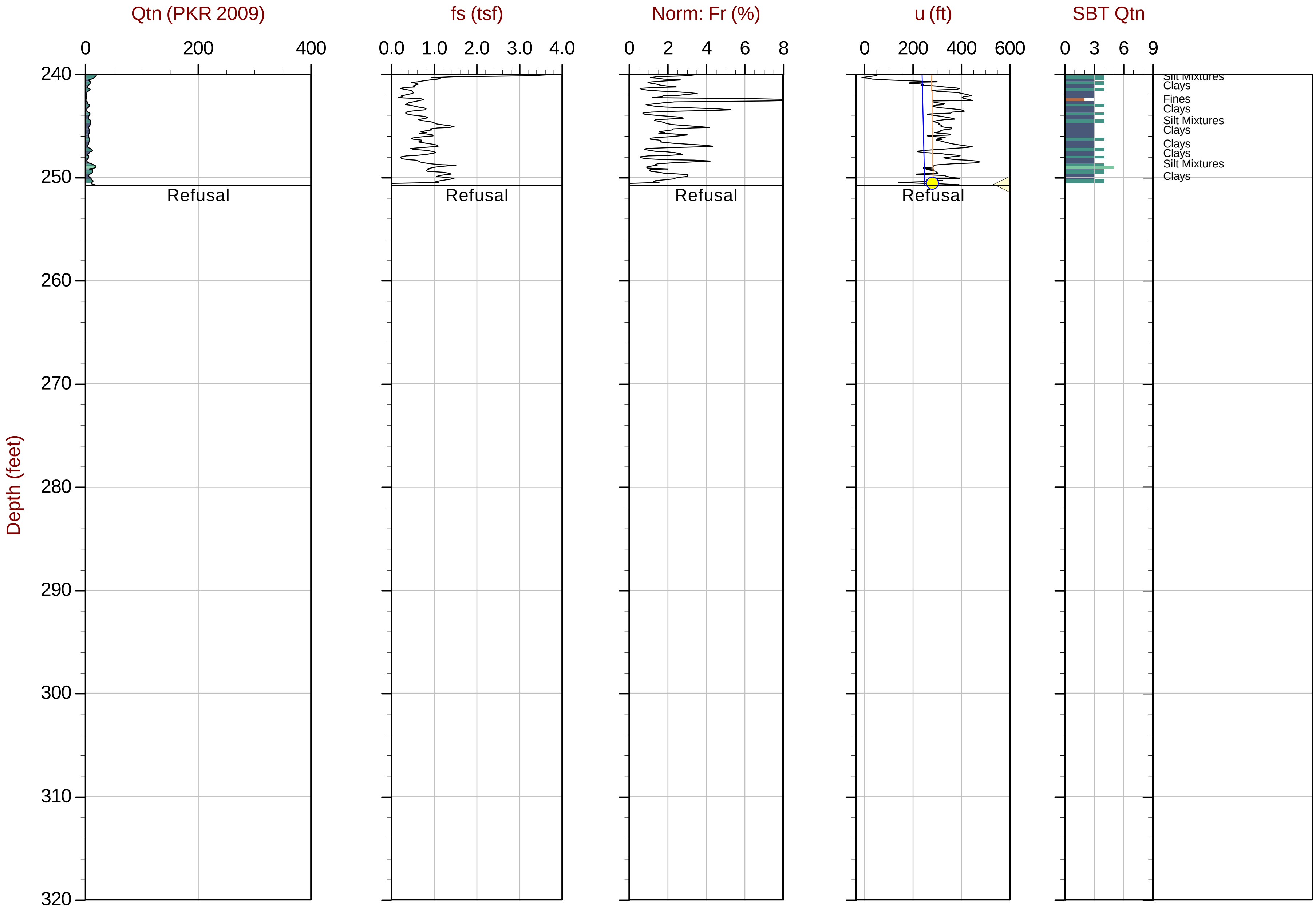
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 4 of 4

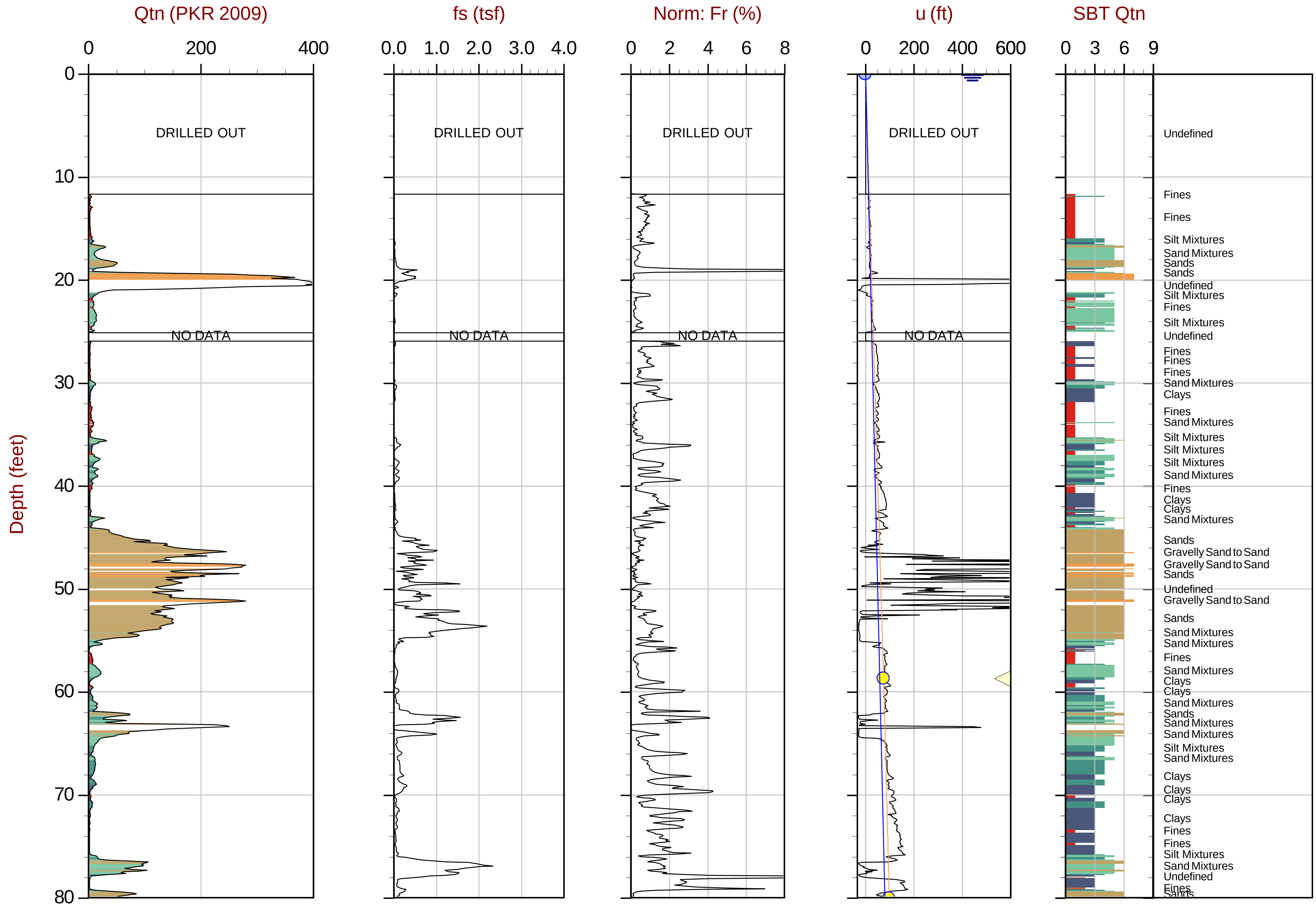
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 1 of 3

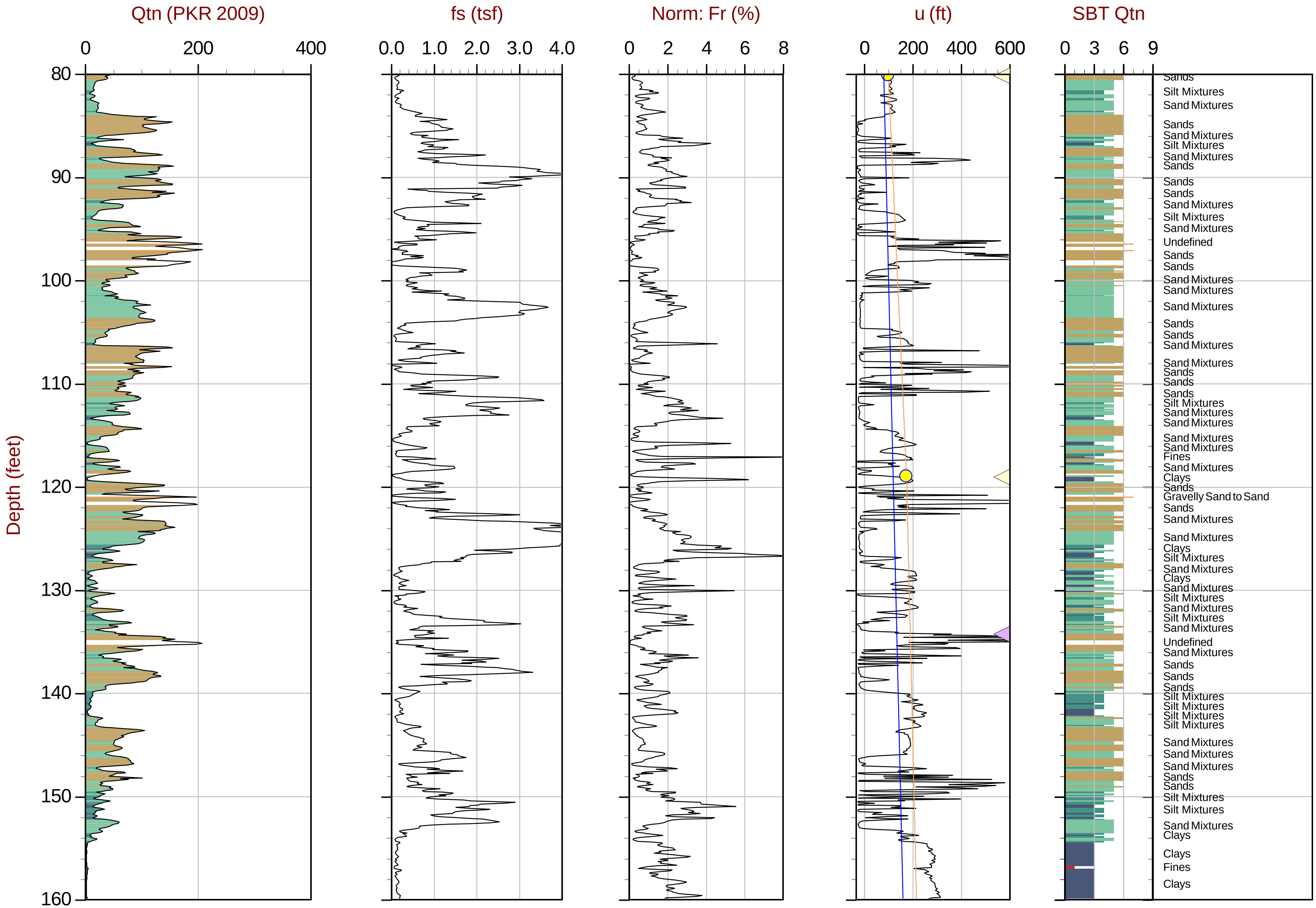
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

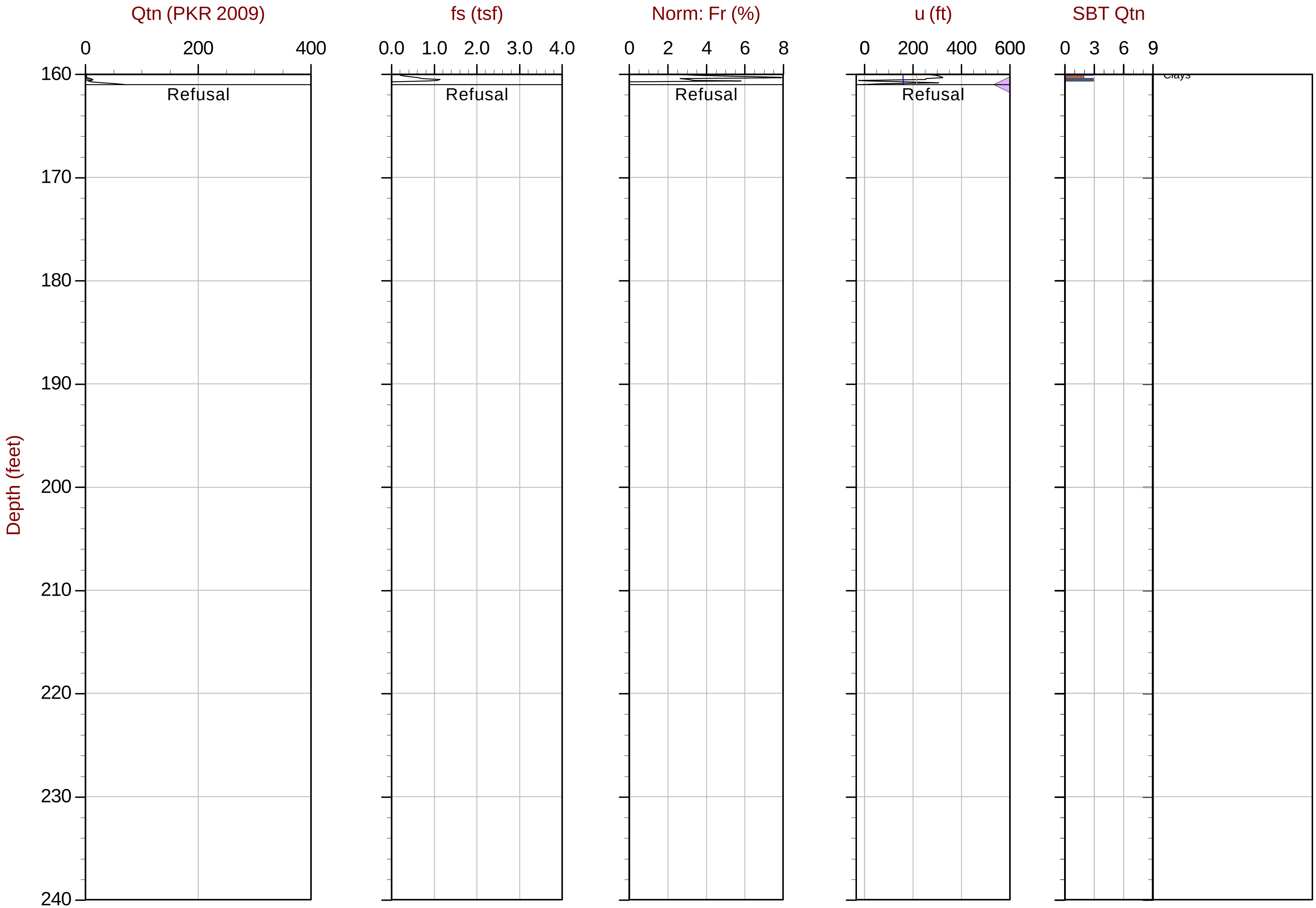
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208504m E: 485096m

Overplot Item: Assumed Ueq, Ueq, Dissipation, equilibrium achieved, Dissipation, equilibrium not achieved, Equilibrium profile, Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF
Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208504m E: 485096m

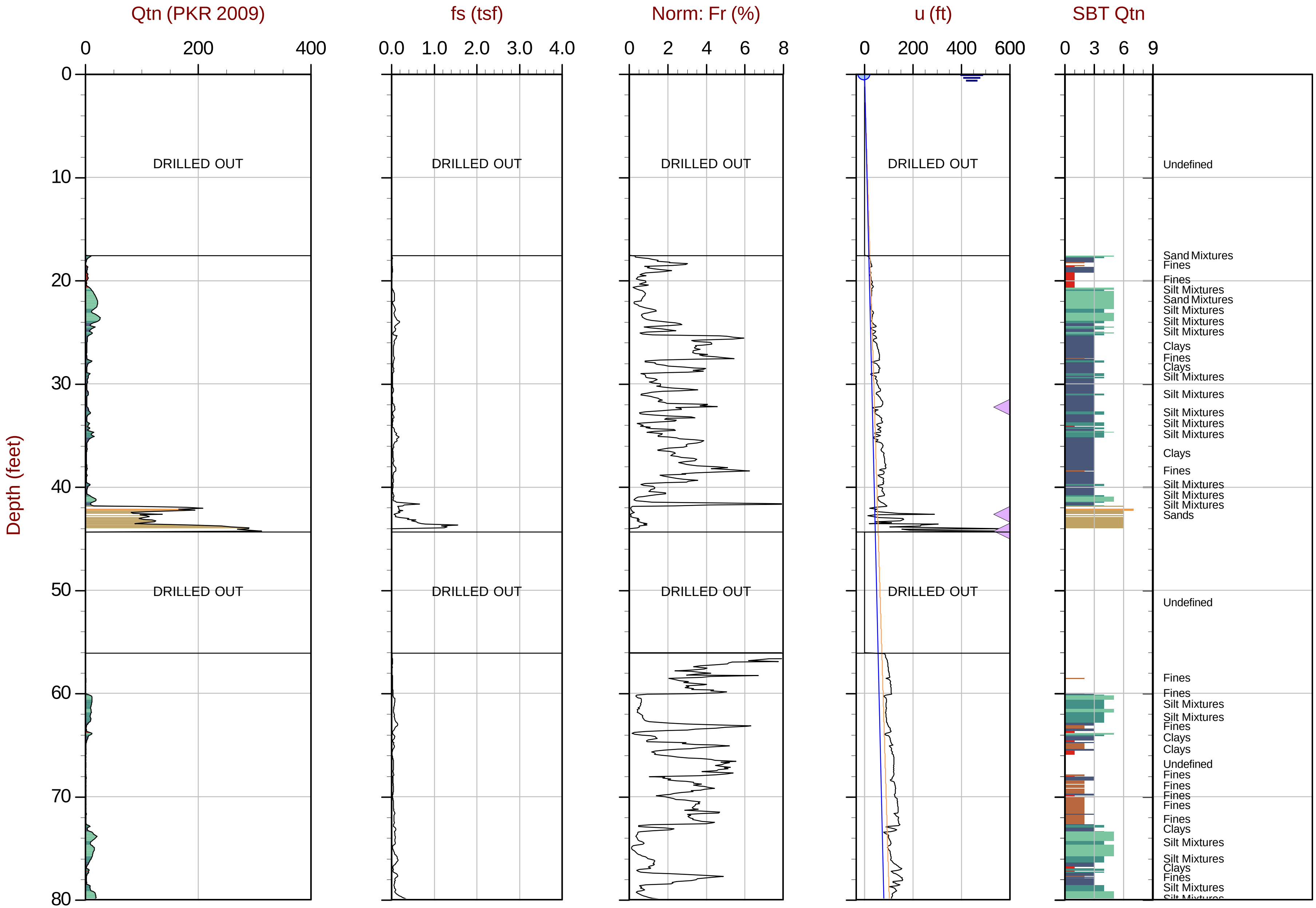
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 1 of 3

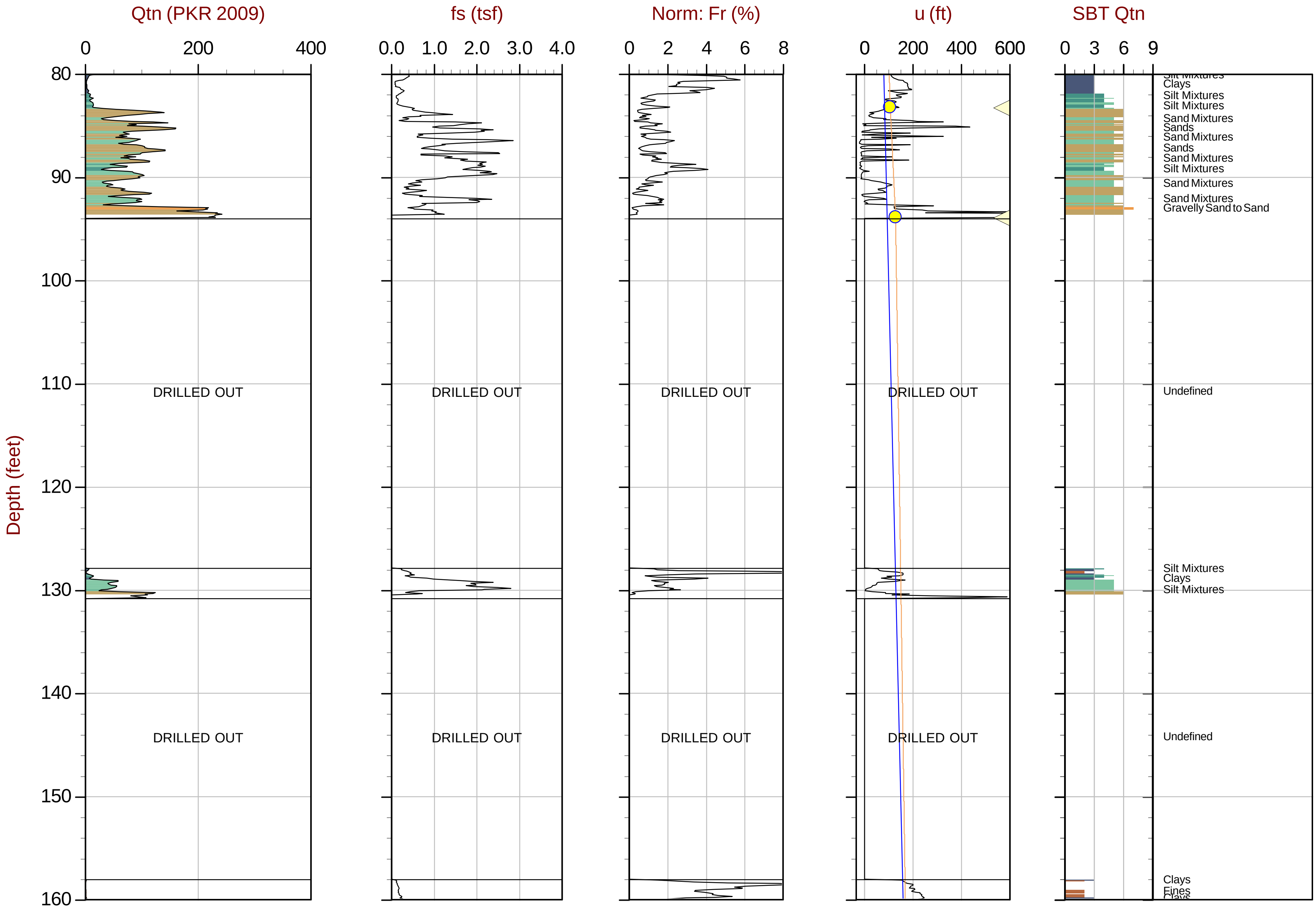
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 2 of 3

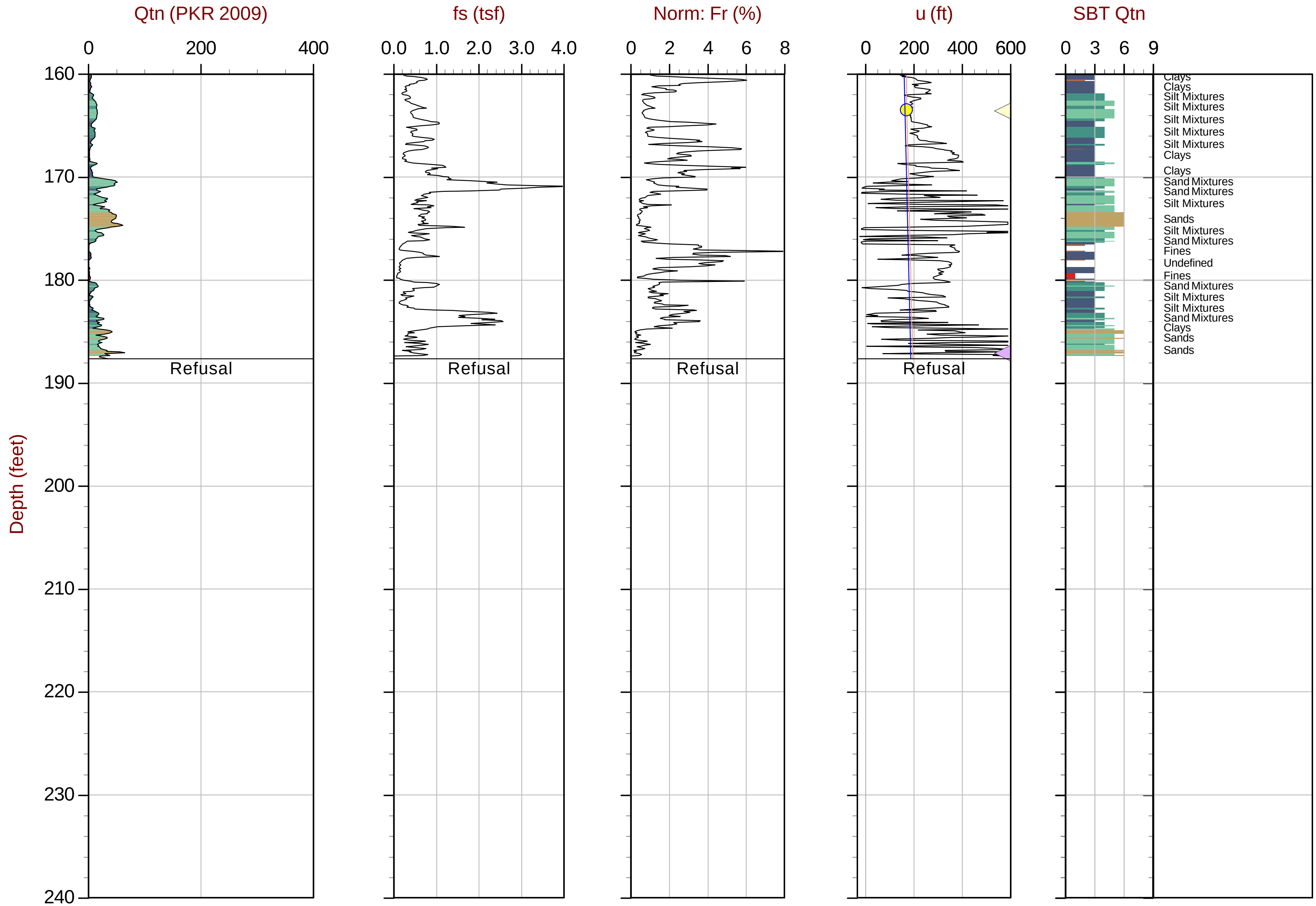
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 3 of 3

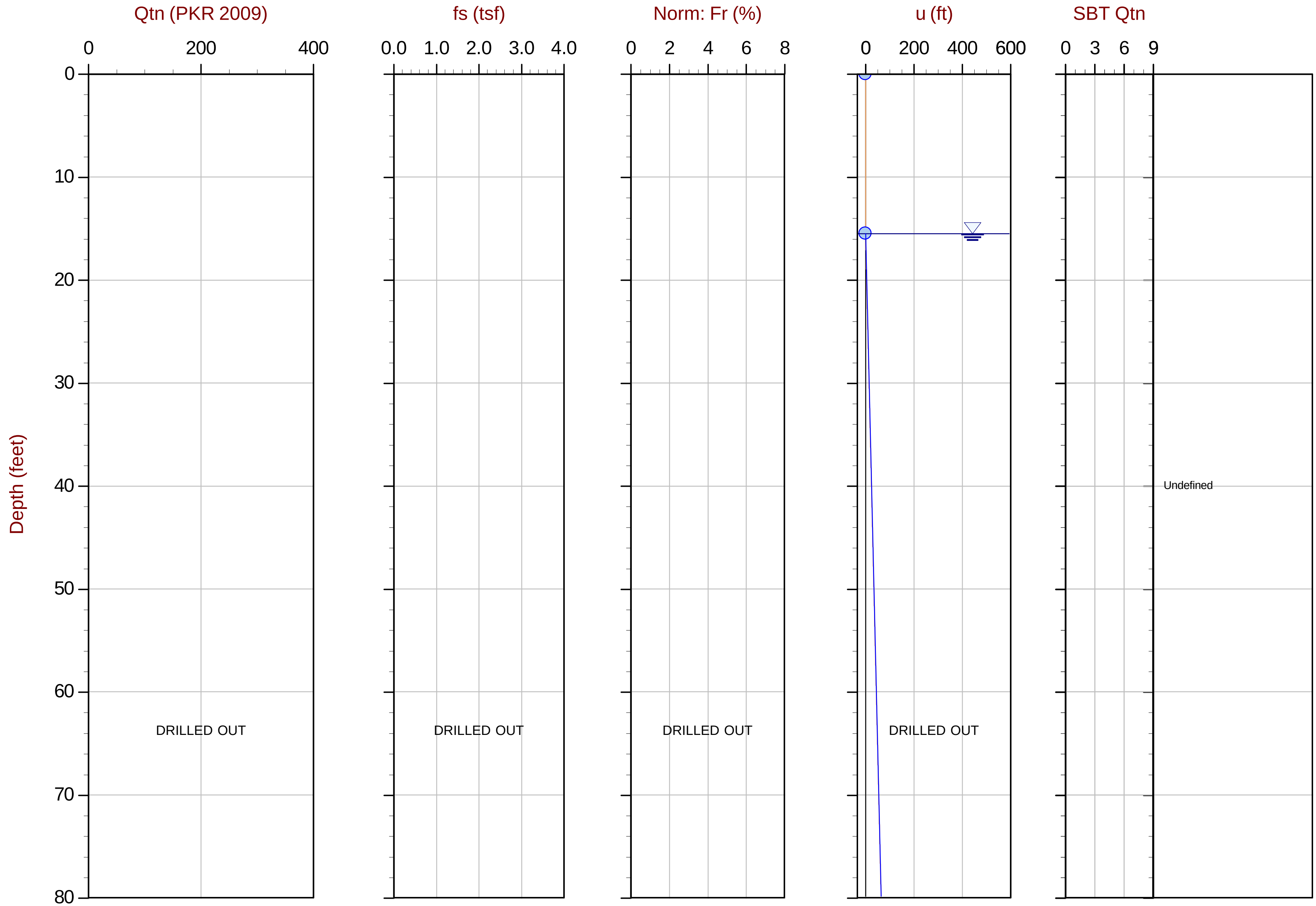
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 1 of 3

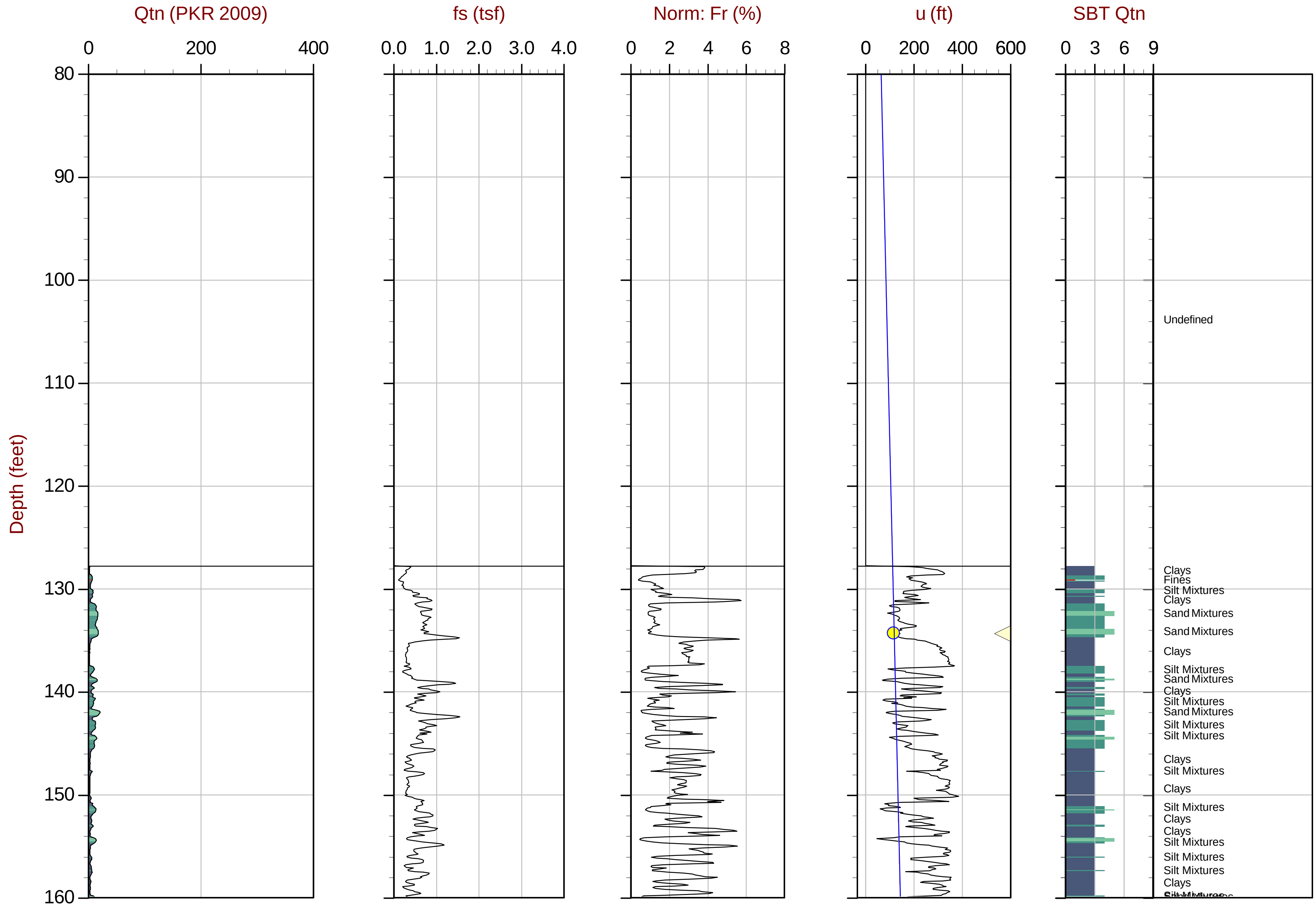
Overplot Item: Assumed Ueq, Ueq, Dissipation, equilibrium achieved, Dissipation, equilibrium not achieved, Equilibrium profile, Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 2 of 3

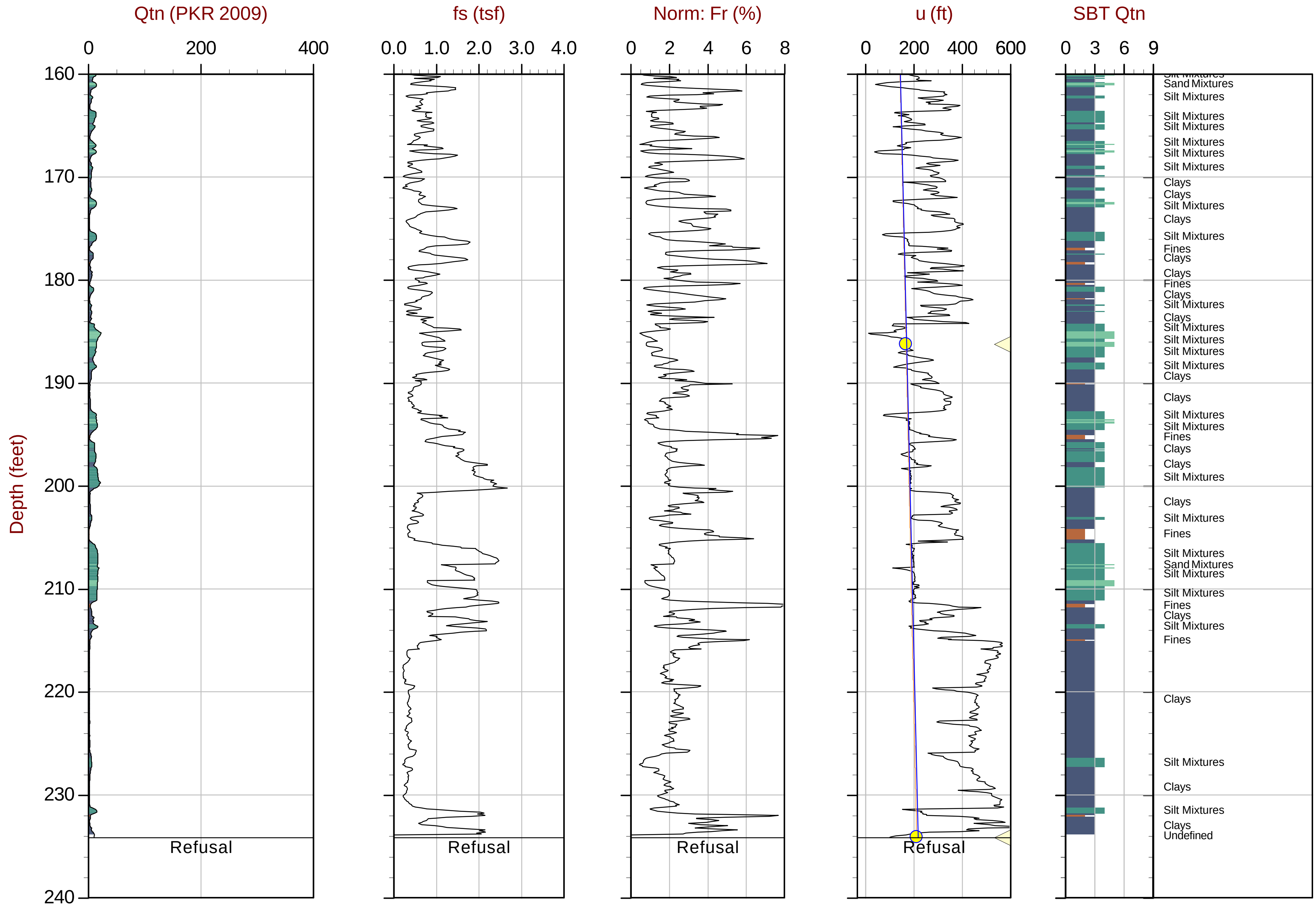
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 3 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Cone Penetration Test Advanced Plots with Phi Angle, Undrained Shear Strength (Su-Nkt) and N1(60)

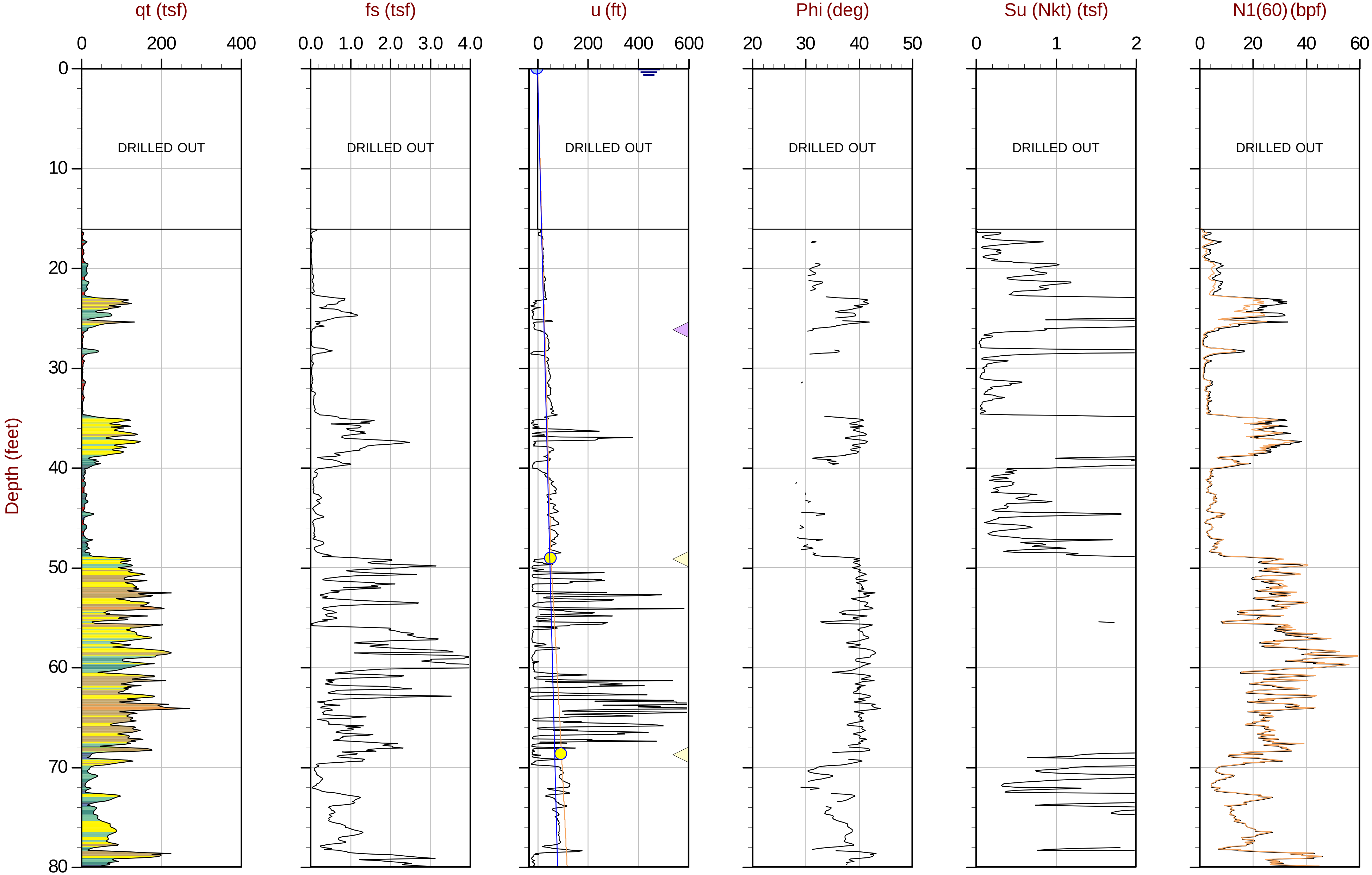
CONETEC

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 1 of 4

N(60) (bpf)

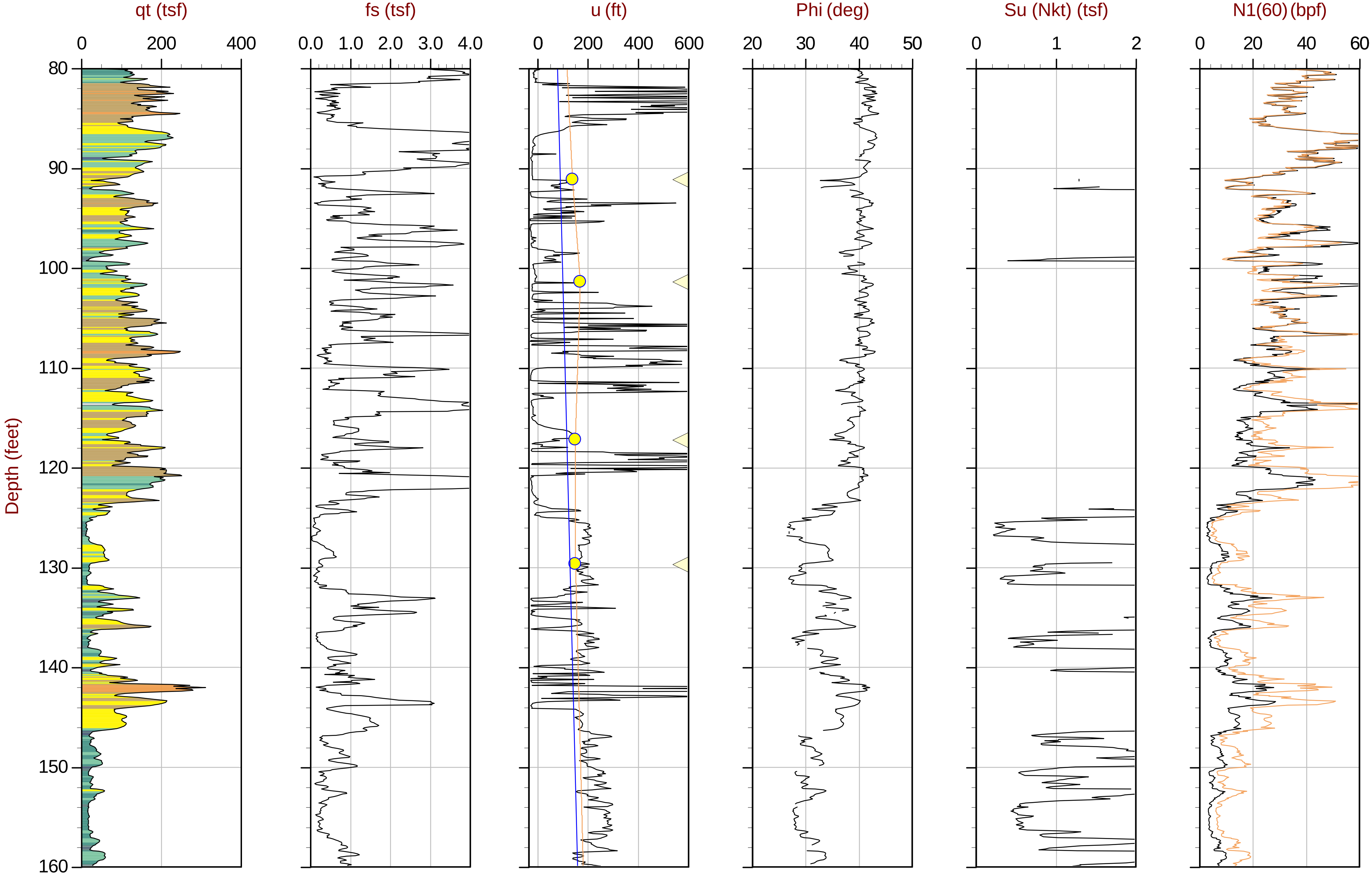
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 2 of 4

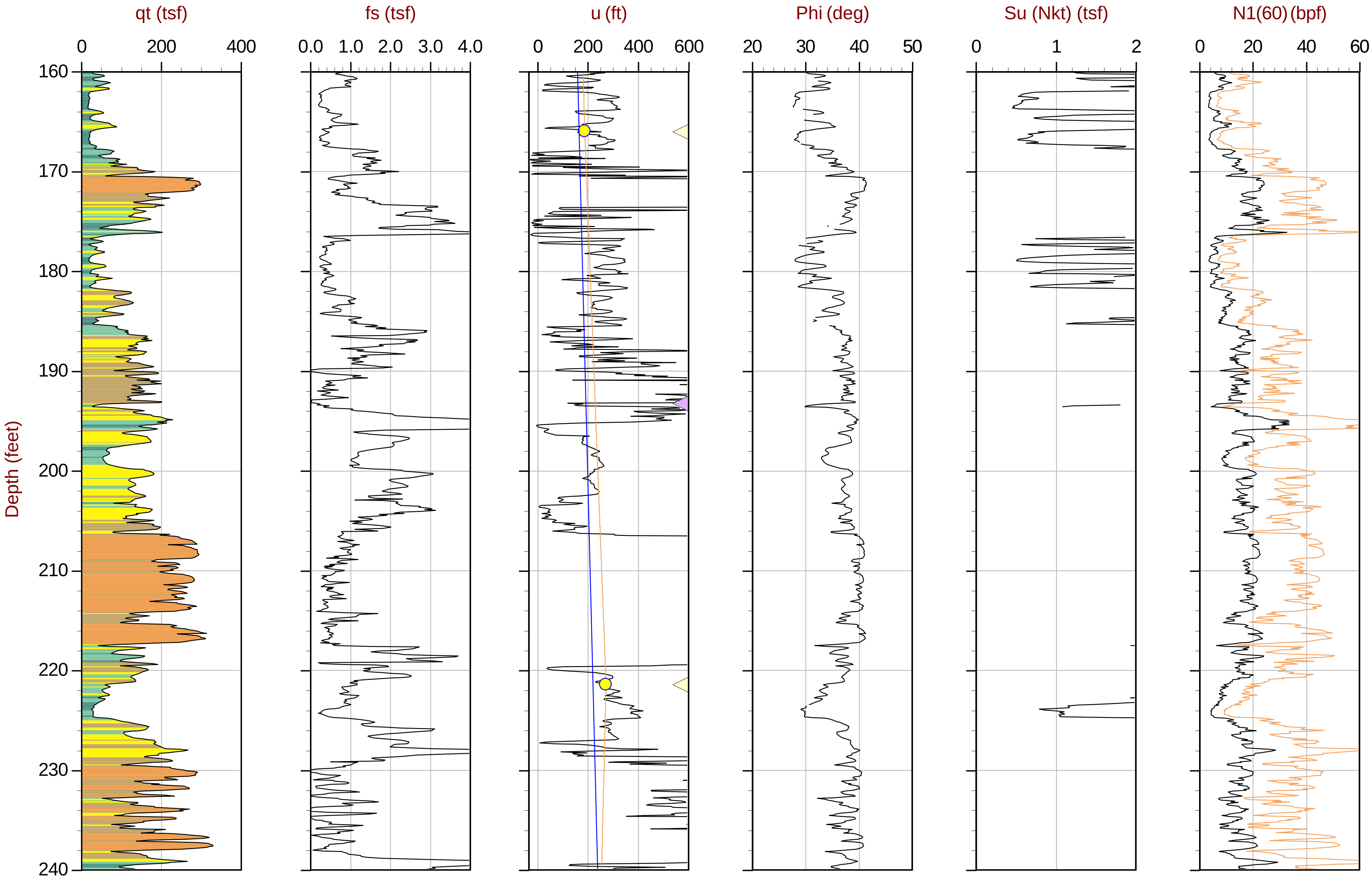
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile; N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 3 of 4

N(60) (bpf)

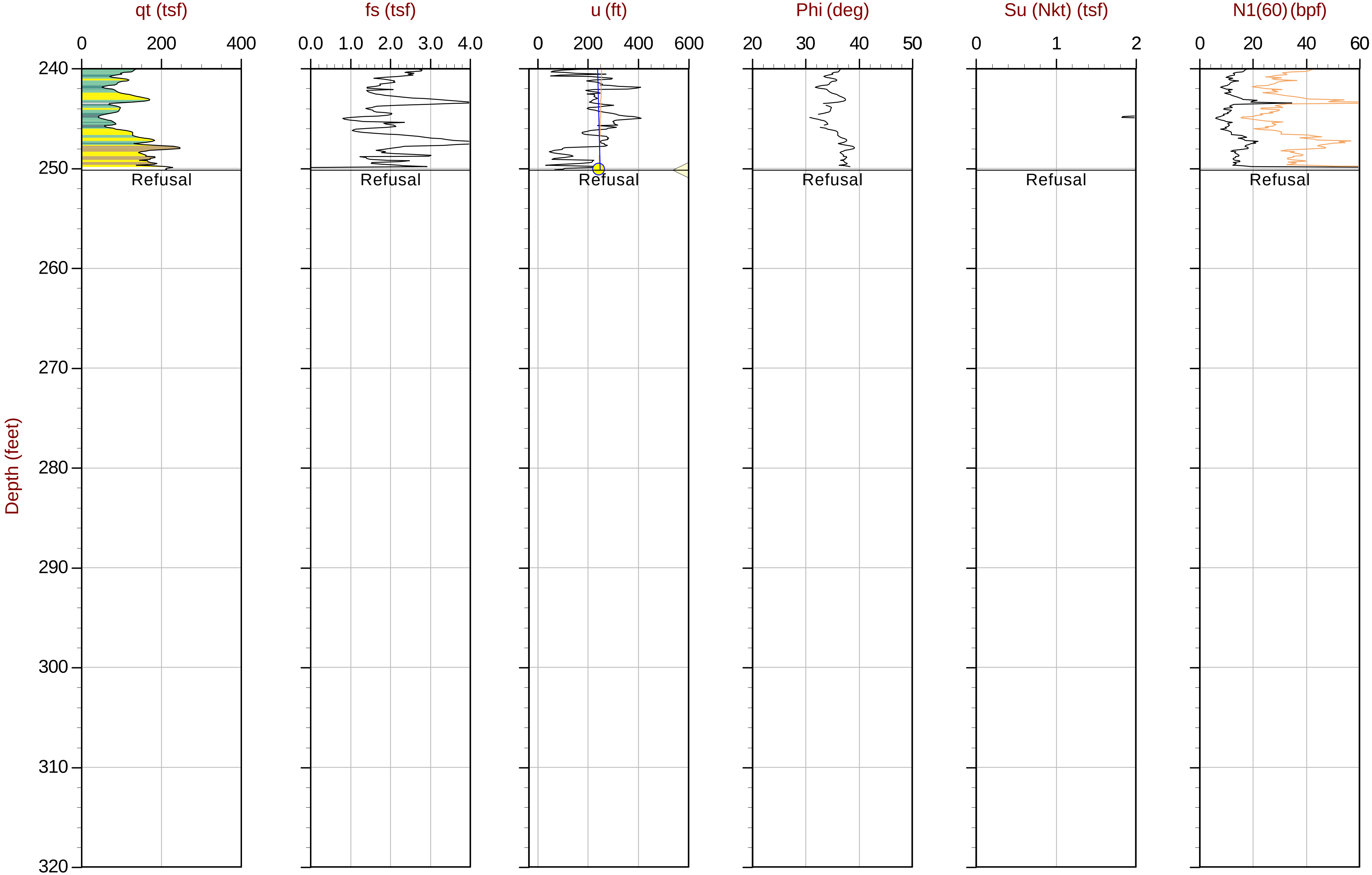
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Equilibrium profile

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 4 of 4

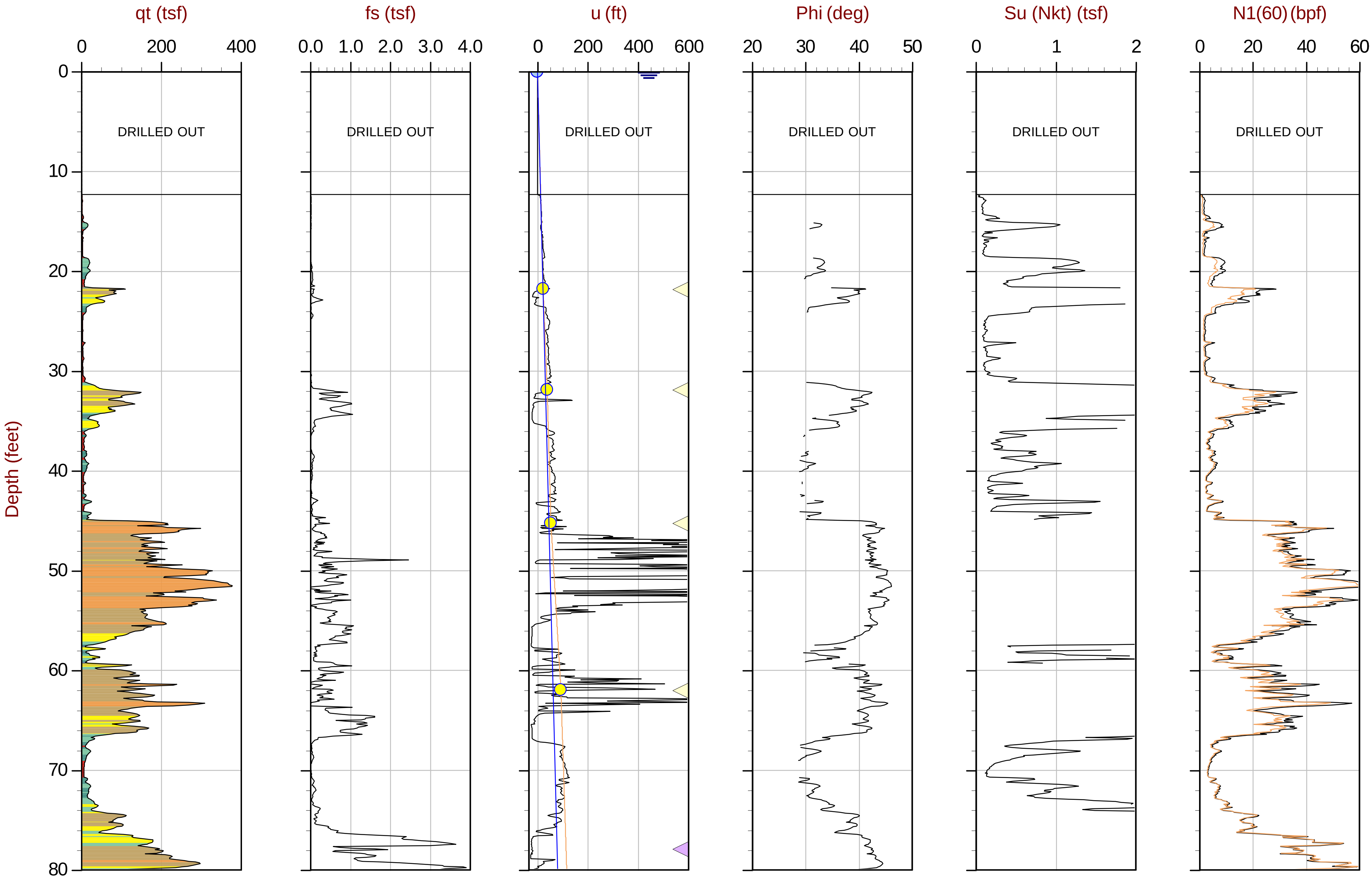
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile; N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:

File: 17-51001_SP24.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 1 of 3

N(60) (bpf)

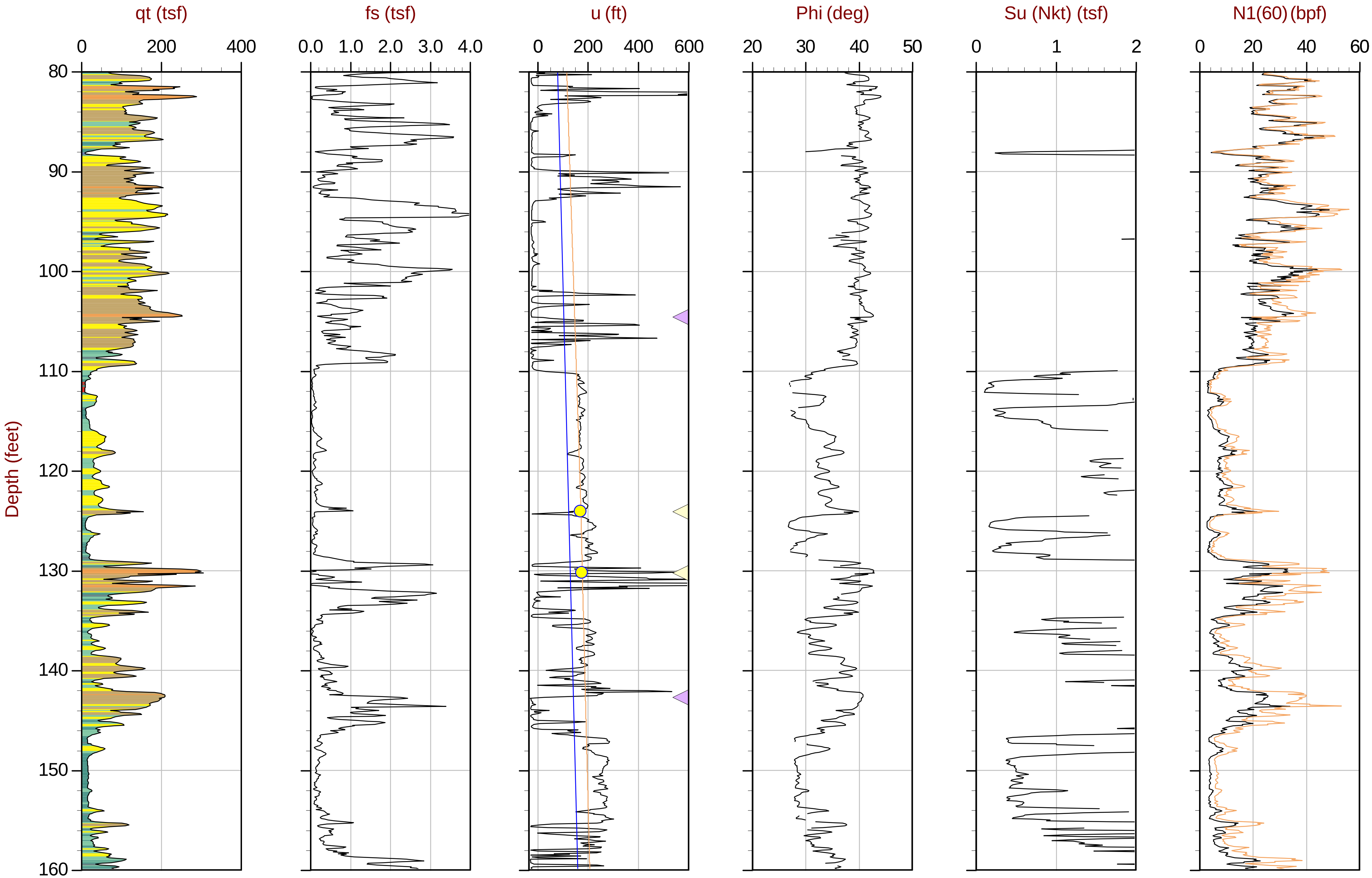
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Equilibrium profile

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:

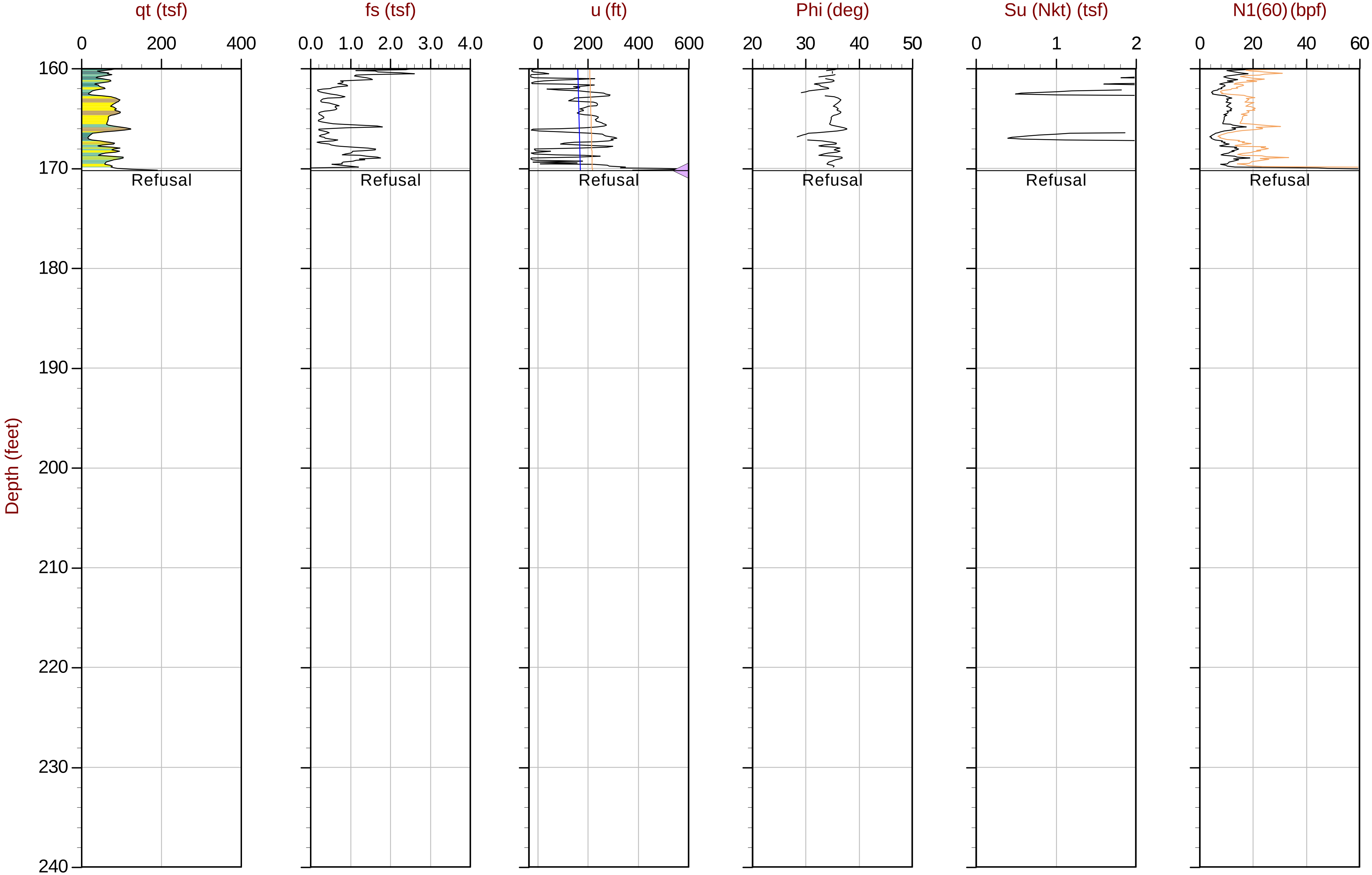
File: 17-51001_SP24.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m

Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Equilibrium profile
N(60) (bpf)

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF
Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 3 of 3

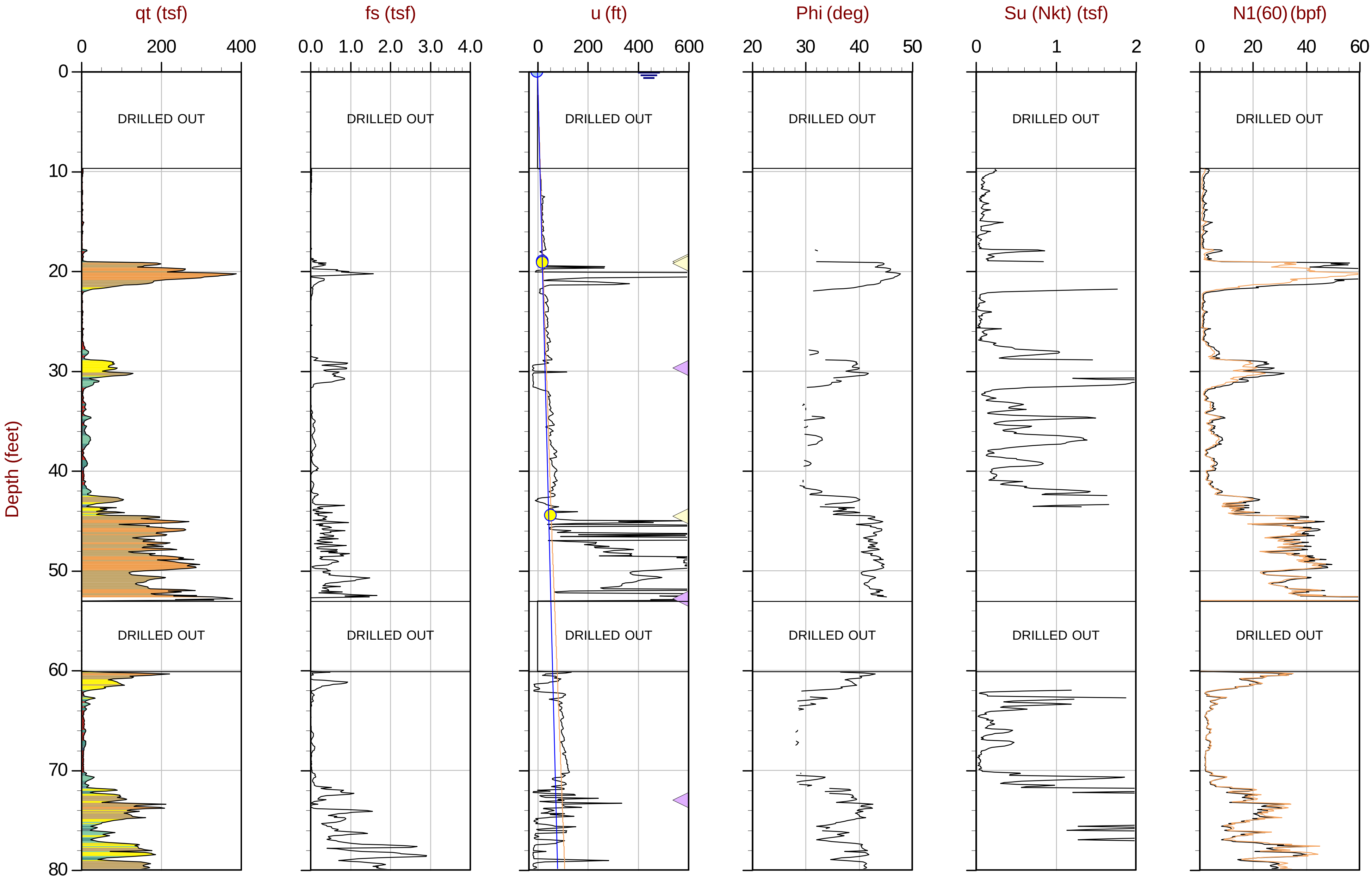
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile; N(60) (bpf)

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

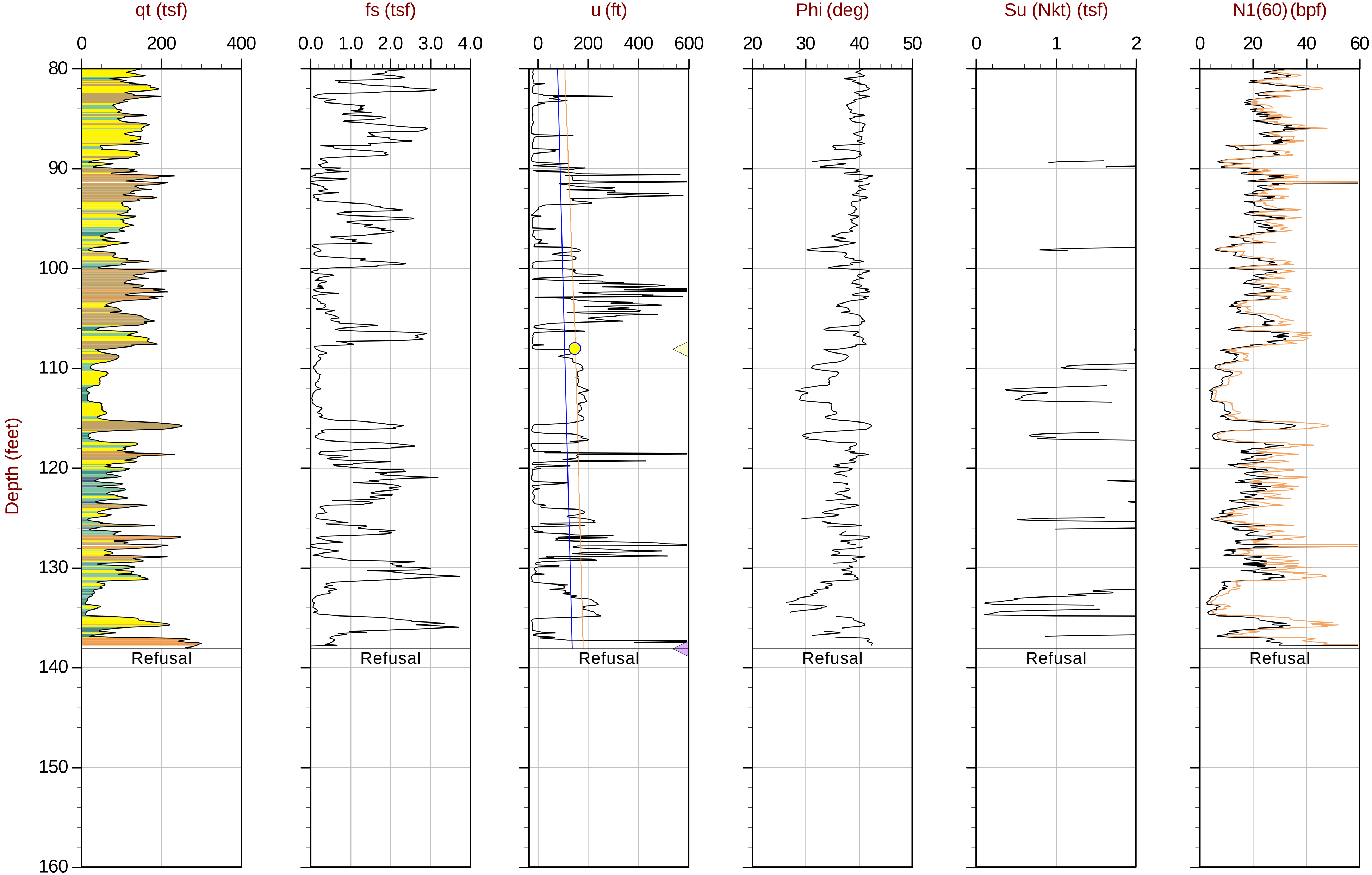
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m

Overplot Item:
- Assumed Ueq
- Ueq
- Dissipation, equilibrium achieved
- Dissipation, equilibrium not achieved
- Hydrostatic Line
- Equilibrium profile
- N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF
Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item: Assumed Ueq; Ueq

File: 17-51001_SP25.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved

Hydrostatic Line
Equilibrium profile

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 2 of 2

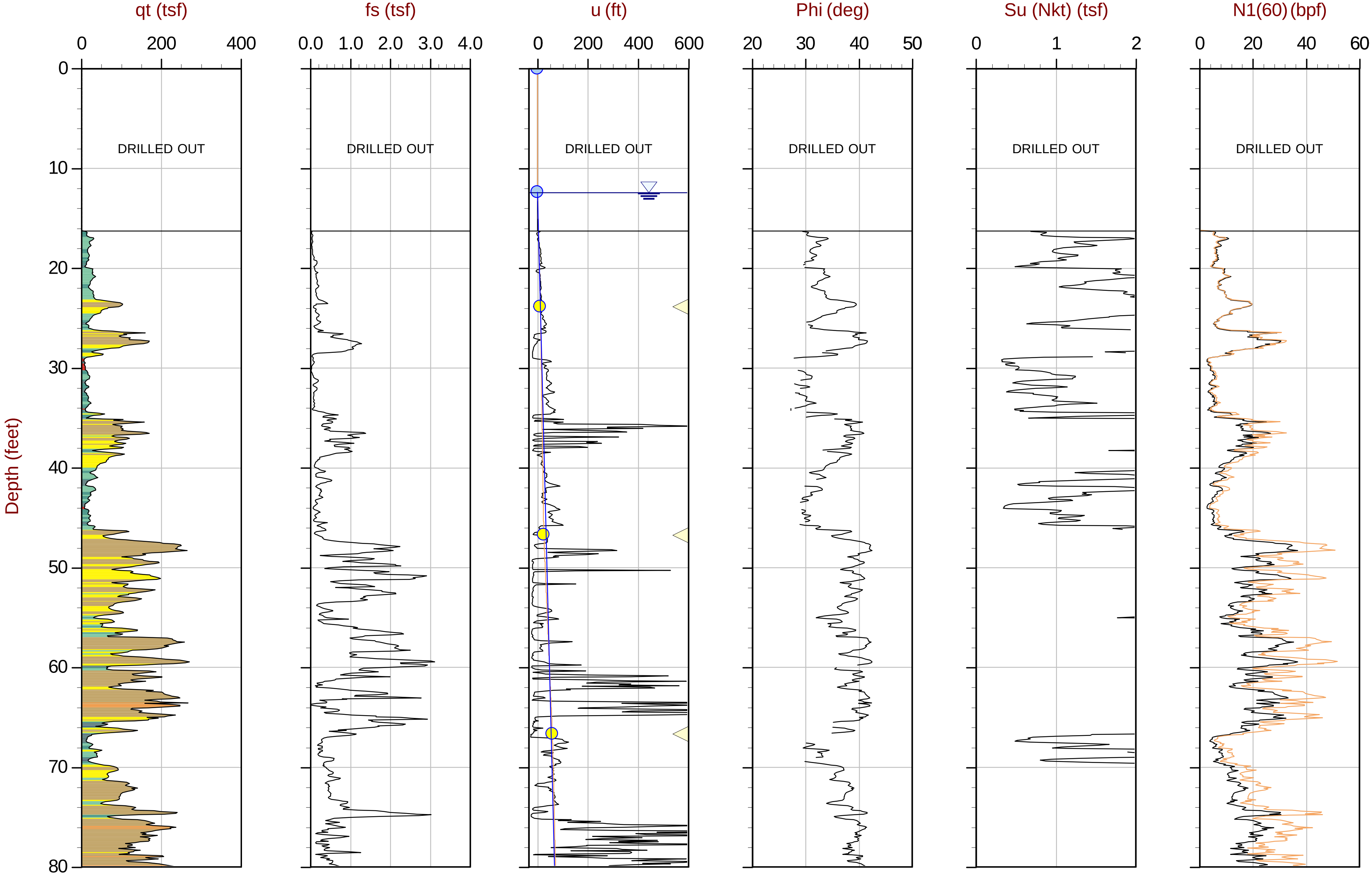
N(60) (bpf)

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 1 of 3

N(60) (bpf)

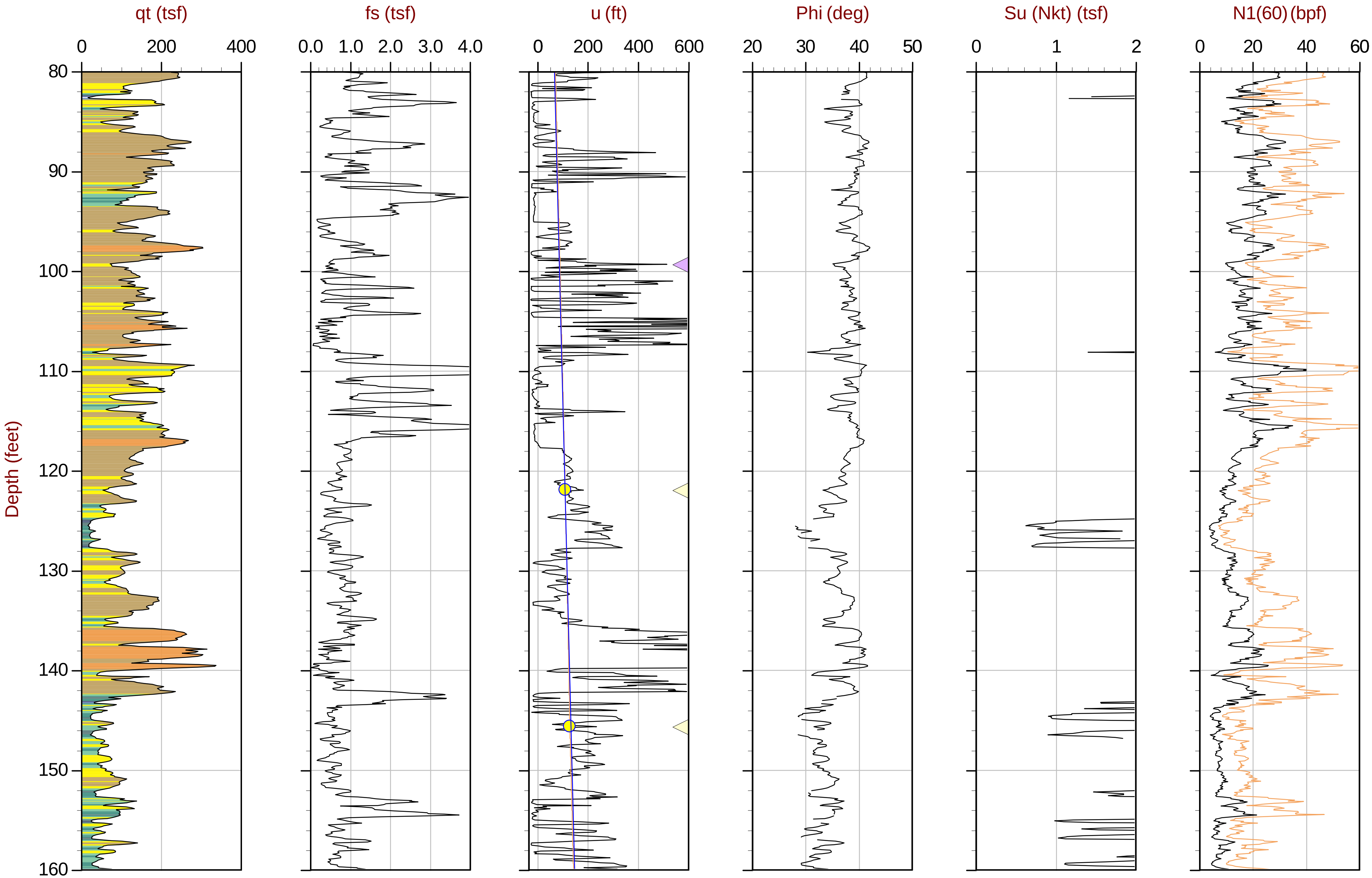
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 2 of 3

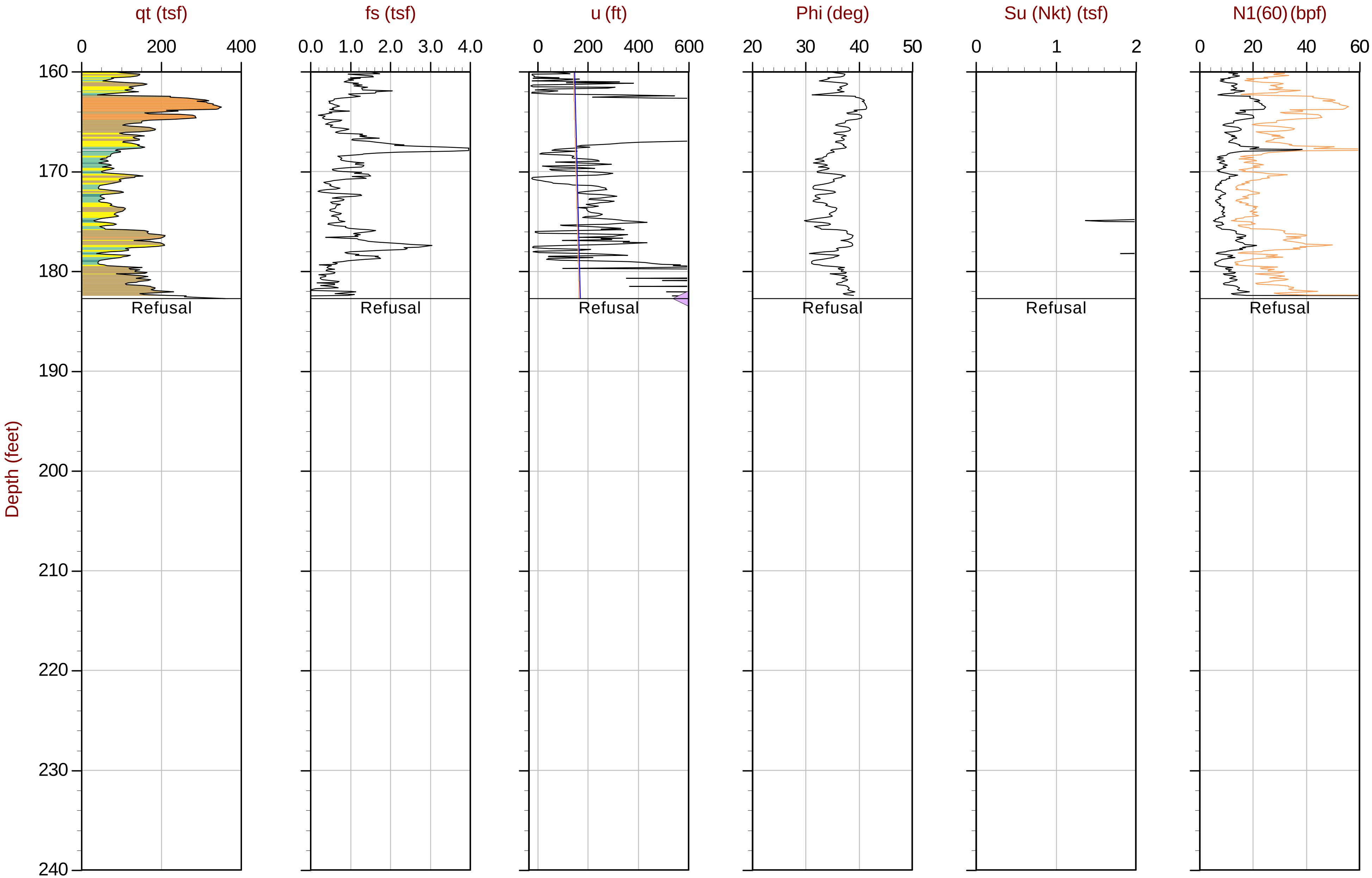
N(60) (bpf)

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item: Assumed Ueq; Ueq

File: 17-51001_SP26.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Equilibrium profile

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 3 of 3

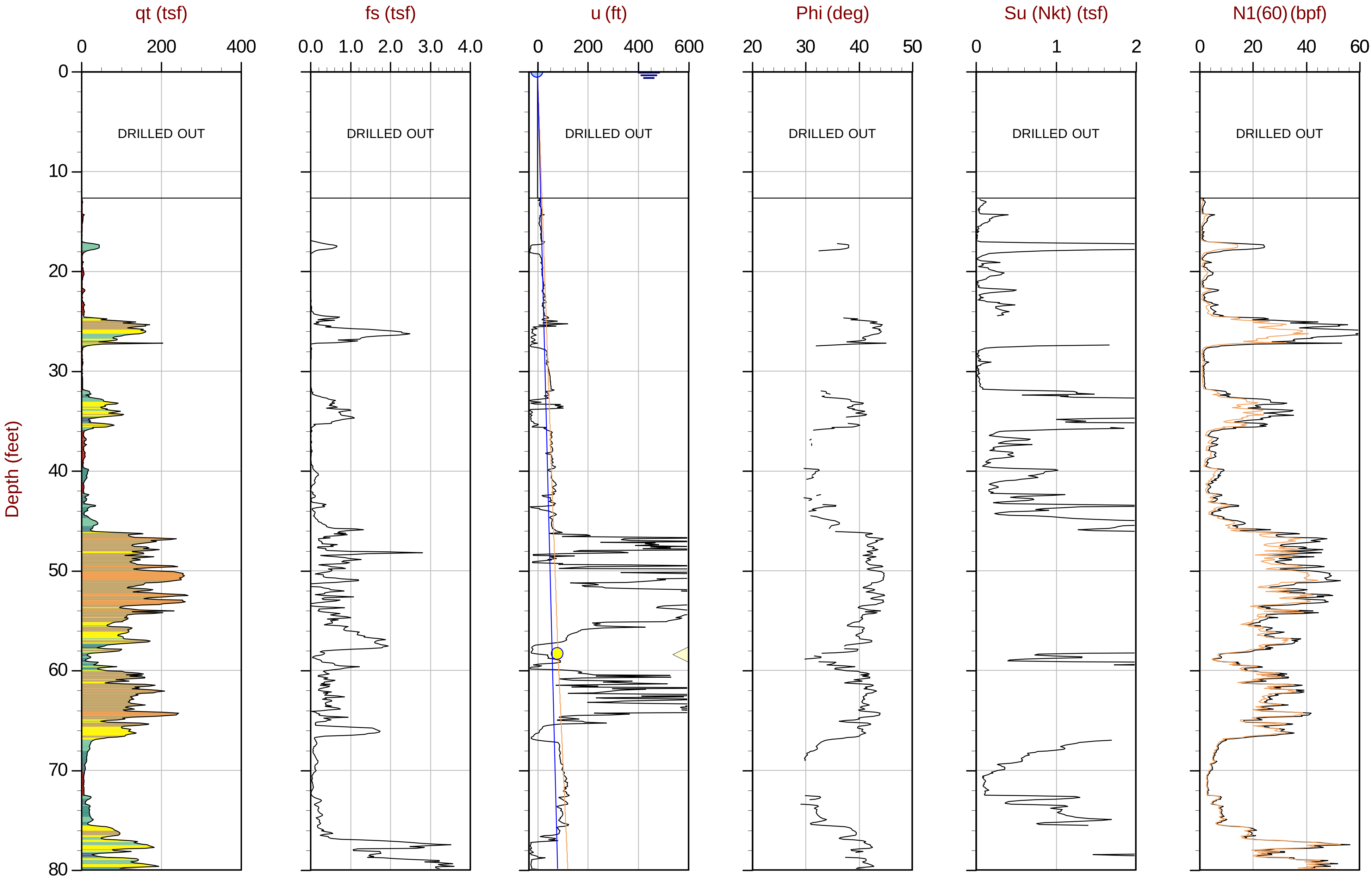
N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 1 of 2

N(60) (bpf)

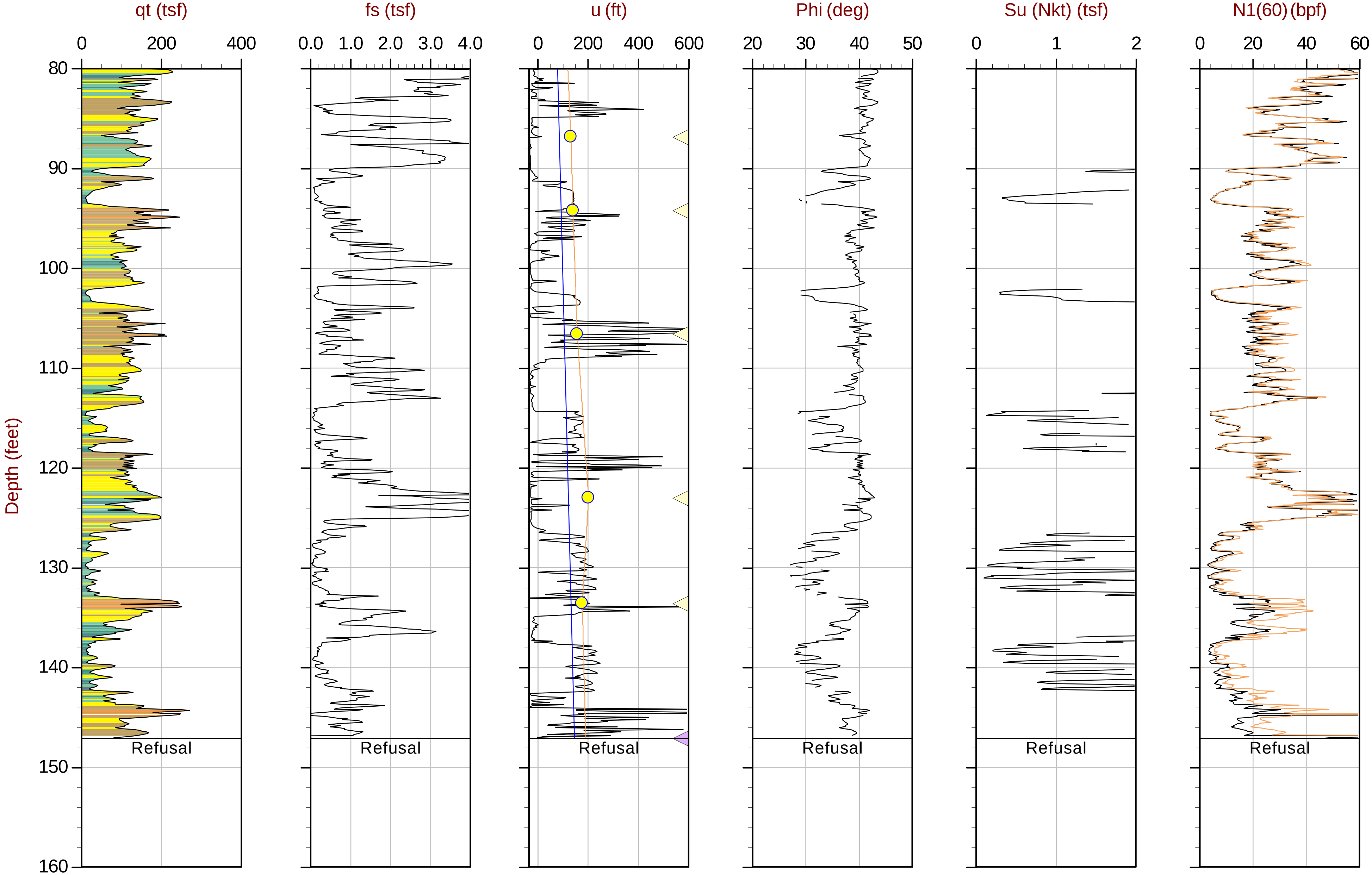
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m

N(60) (bpf)

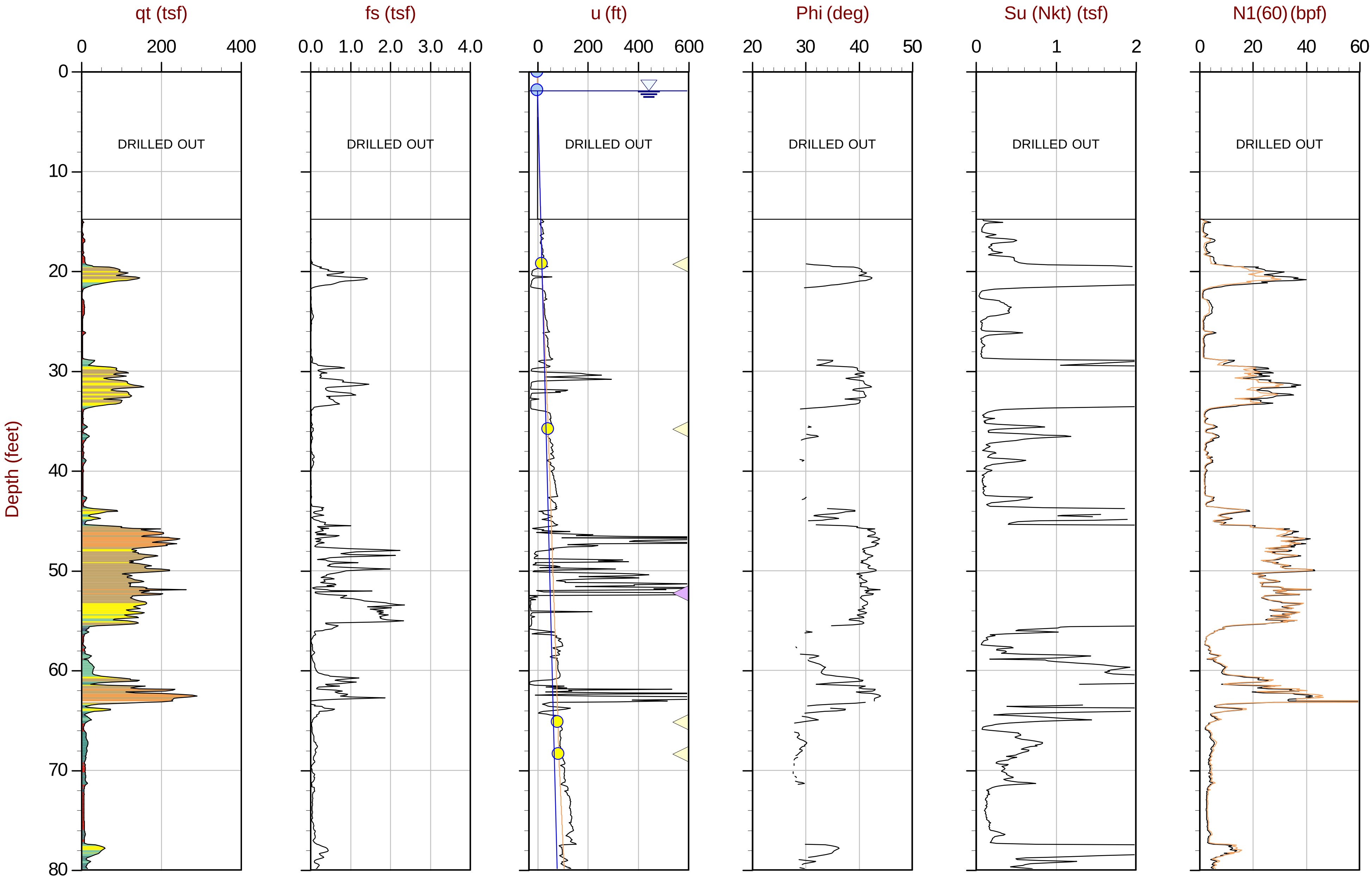
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

File: 17-51001_SP28.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

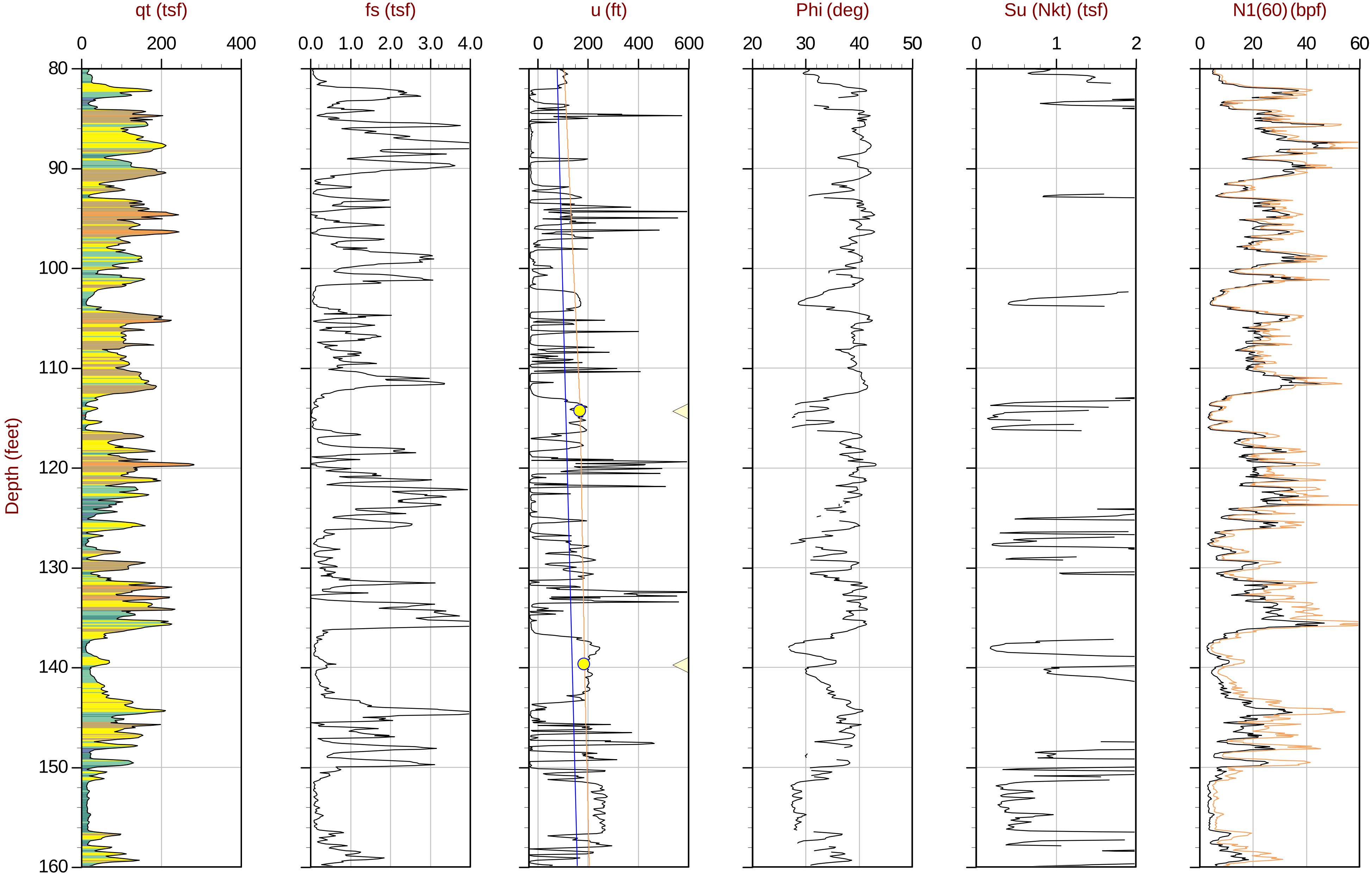
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 1 of 4

N(60) (bpf)

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item: Assumed Ueq, Ueq, Dissipation, equilibrium achieved, Dissipation, equilibrium not achieved, Hydrostatic Line, Equilibrium profile

File: 17-51001_SP28.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m

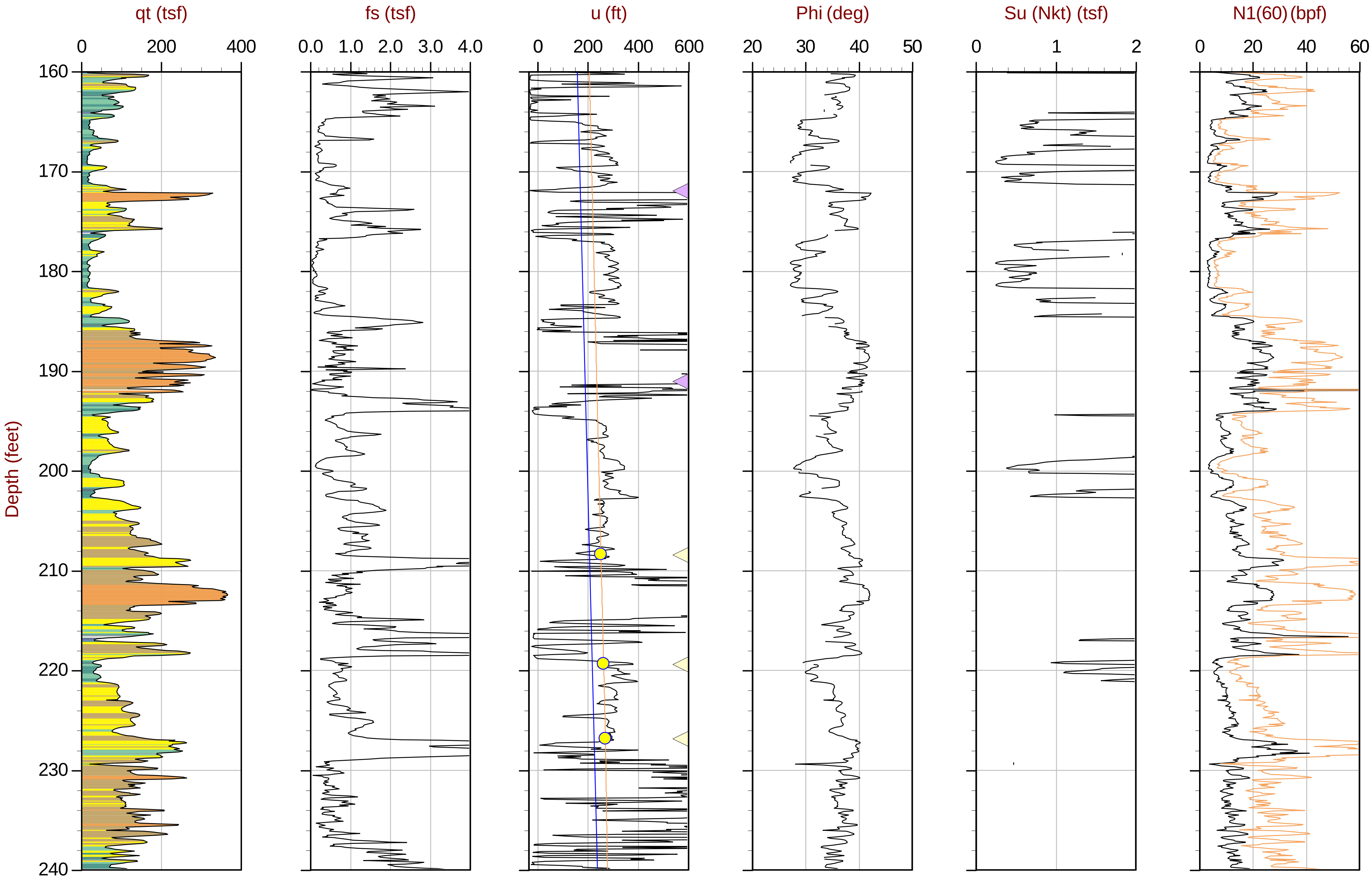
N(60) (bpf)

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

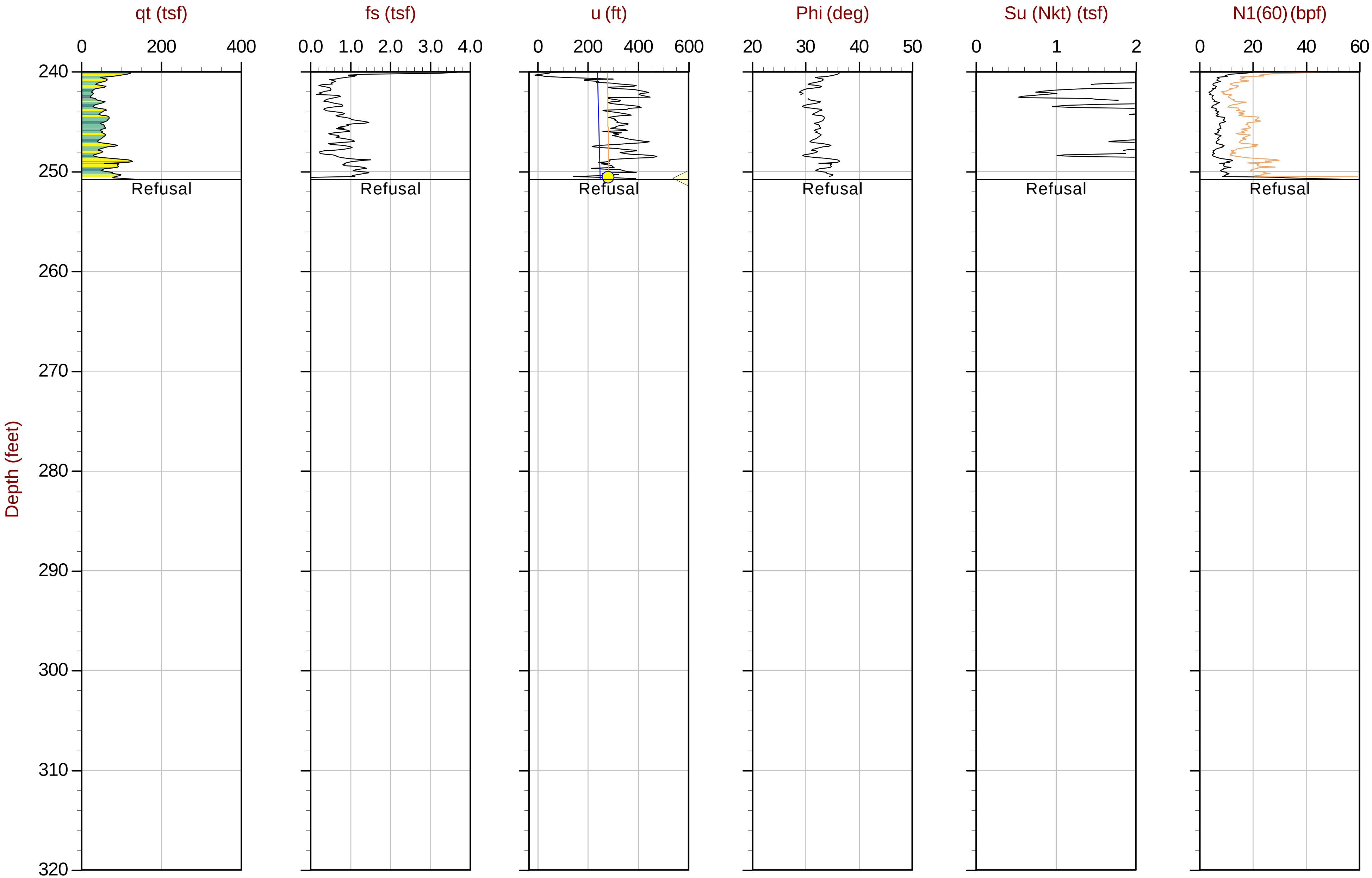
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 3 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile; N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF
Sounding: SCPT17-28
Cone: 473:T1500F15U1K



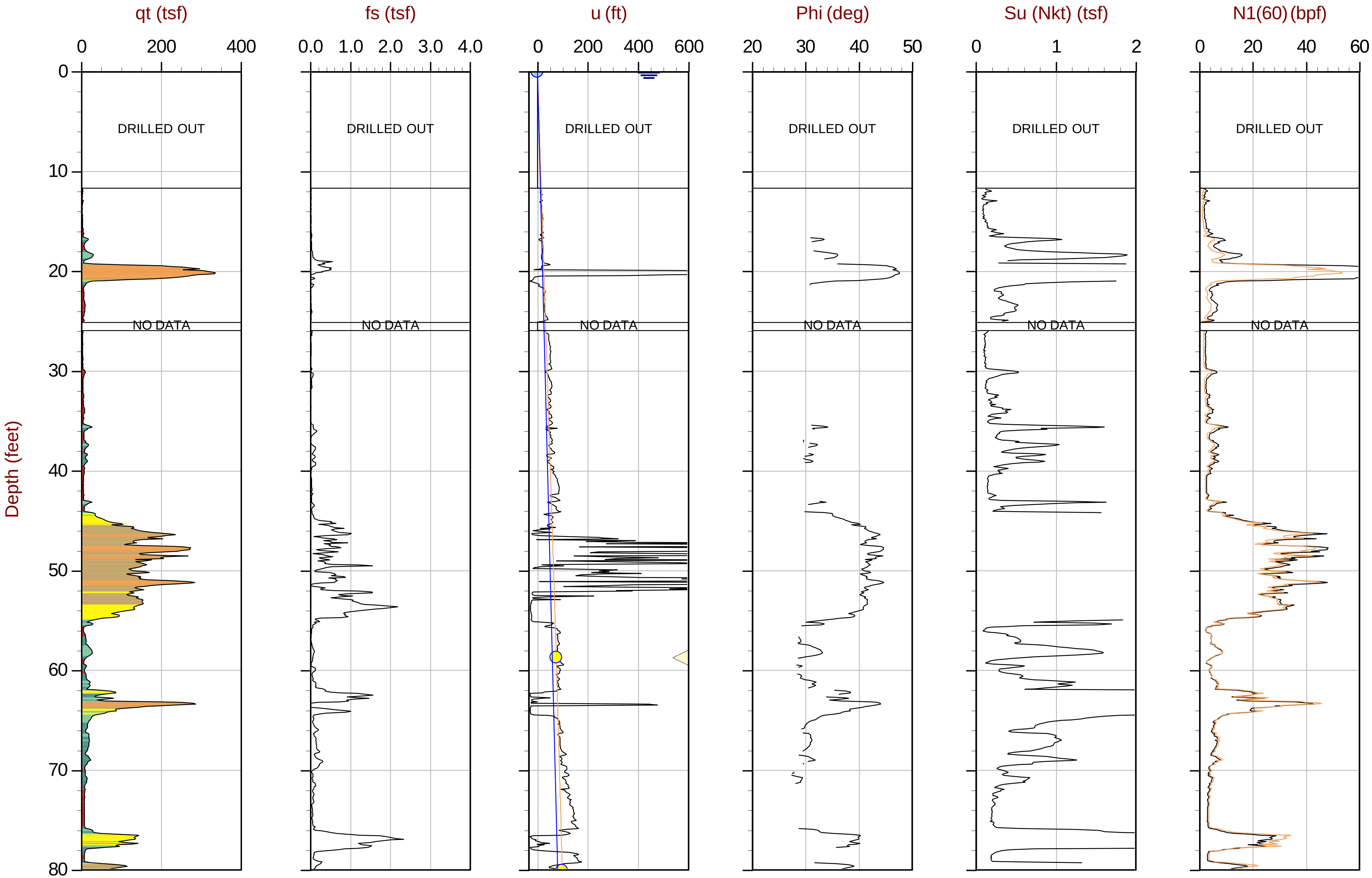
Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
File: 17-51001_SP28.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 4 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile; N(60) (bpf)

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

File: 17-51001_SP29.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 1 of 3

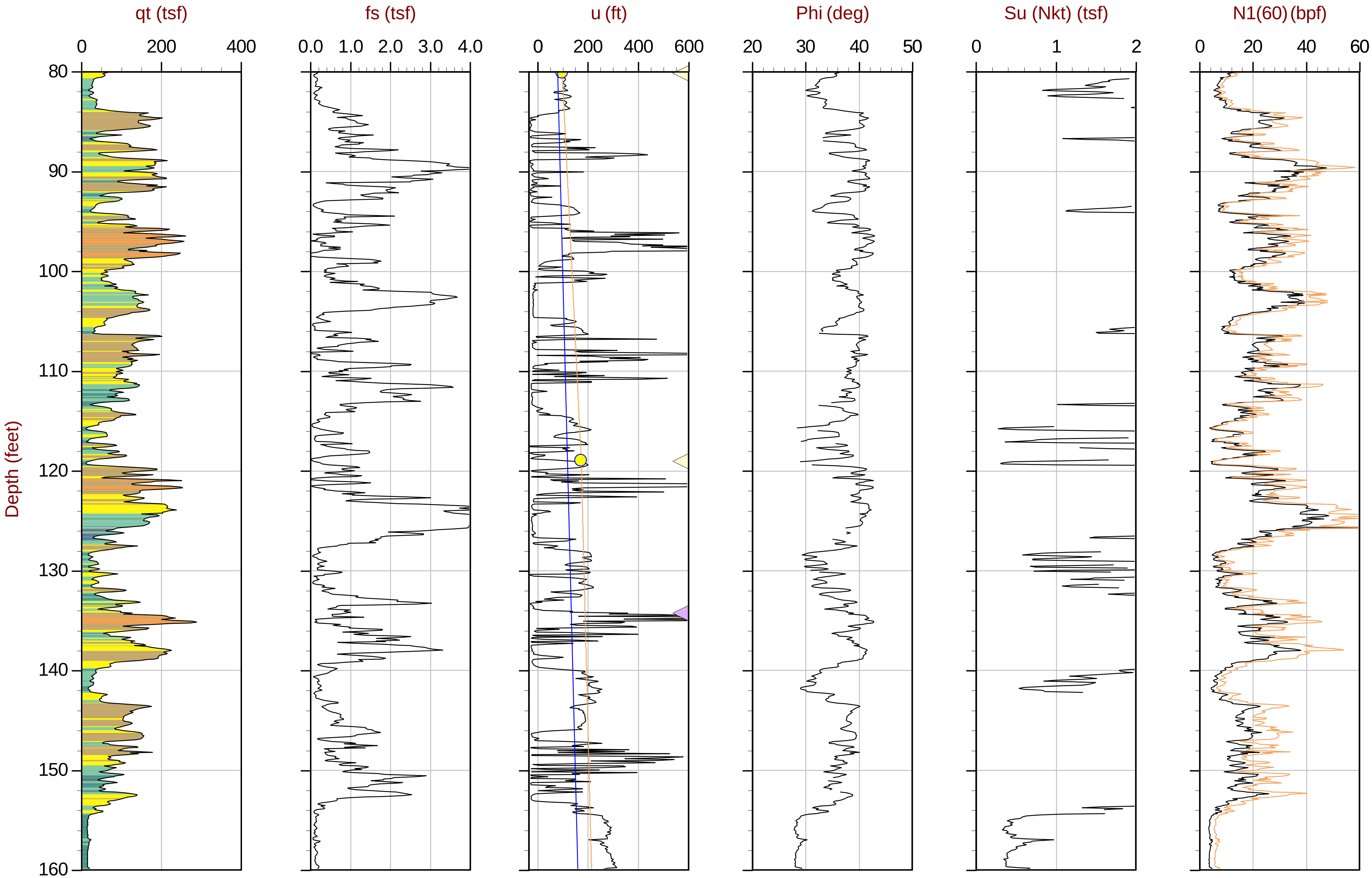
N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 2 of 3

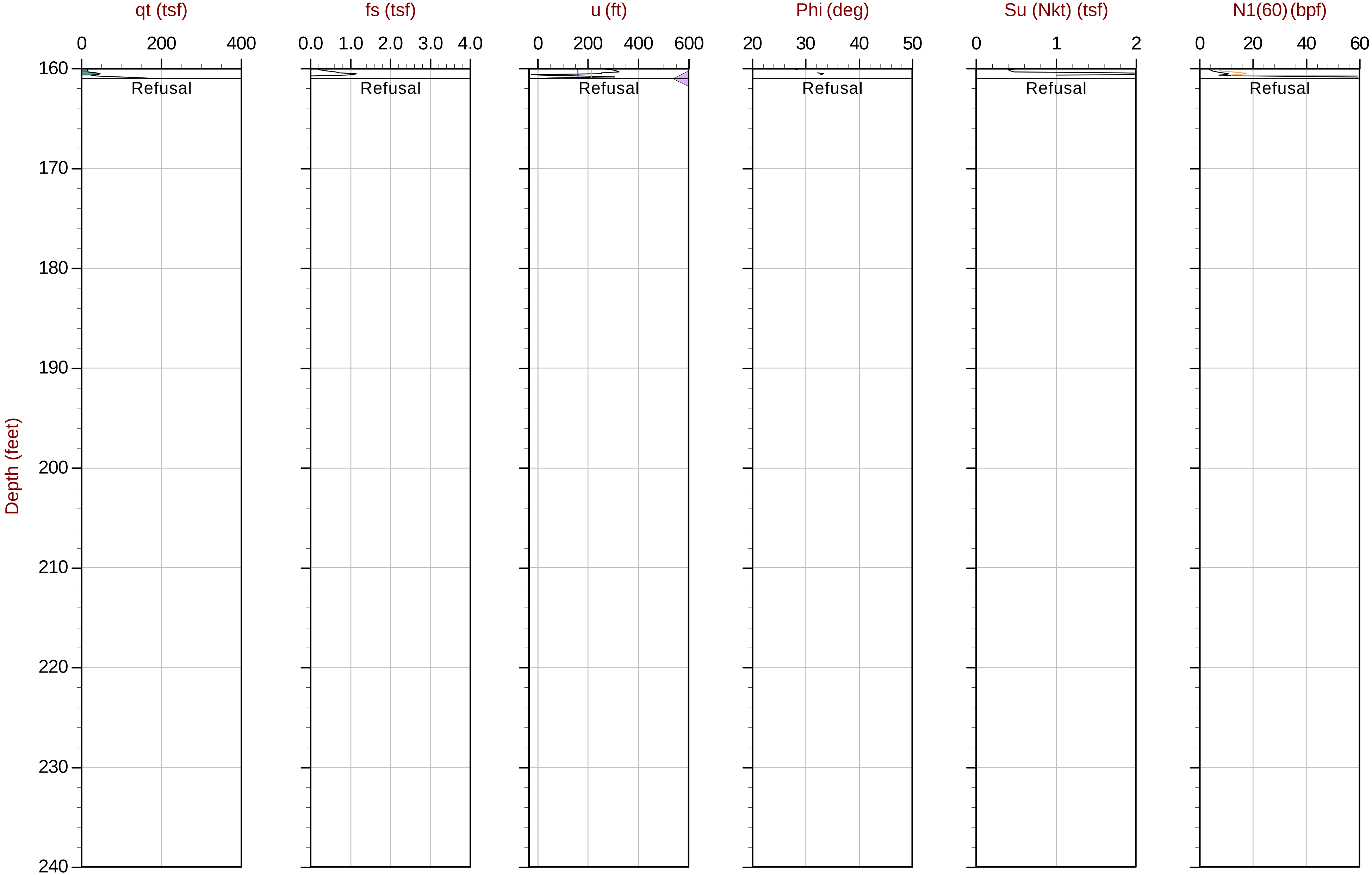
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile; N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



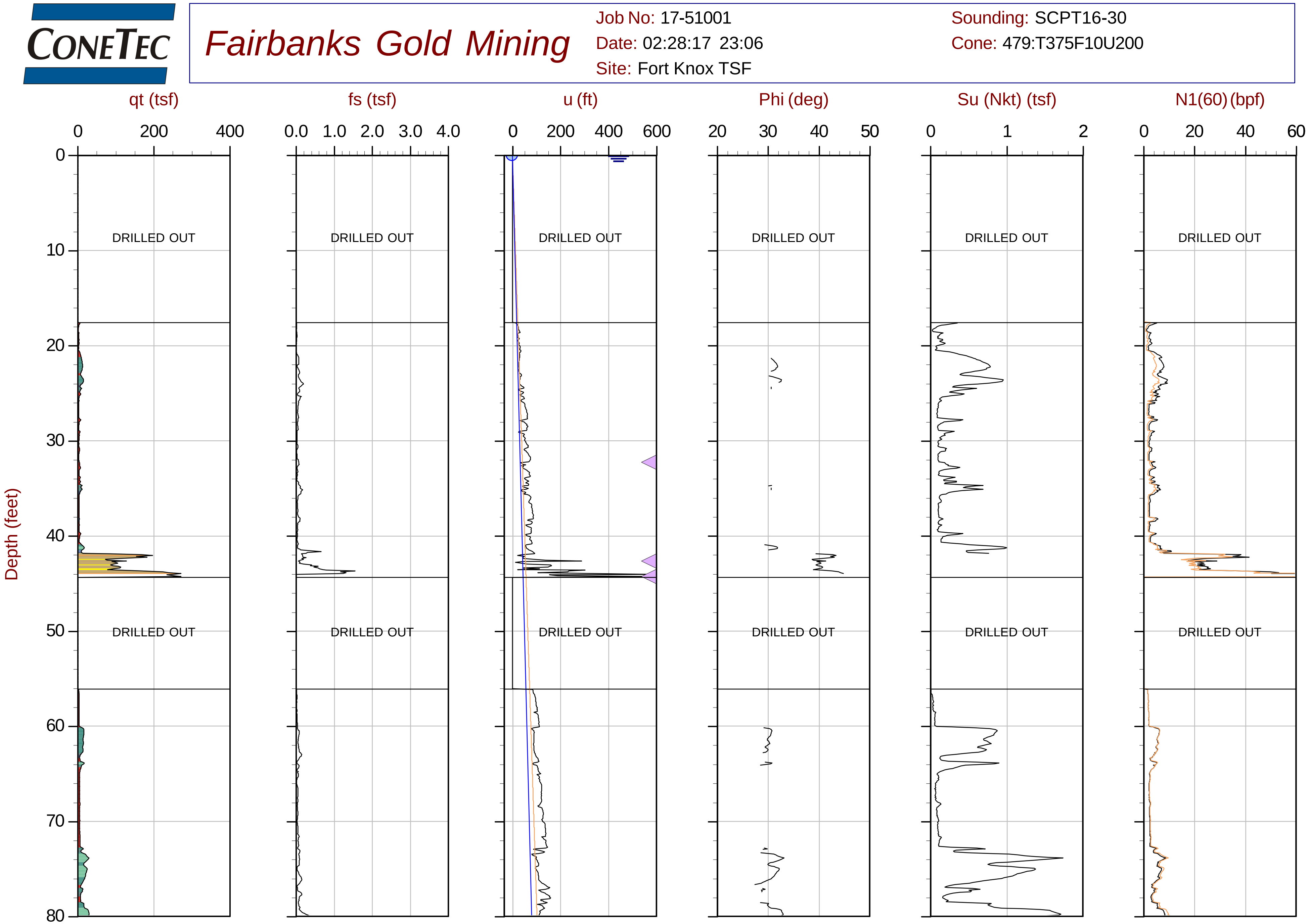
Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:

File: 17-51001_SP29.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 3 of 3

N(60) (bpf)

Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Equilibrium profile



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item: Assumed Ueq, Ueq

File: 17-51001_SP30.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved

Hydrostatic Line
Equilibrium profile

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 1 of 3

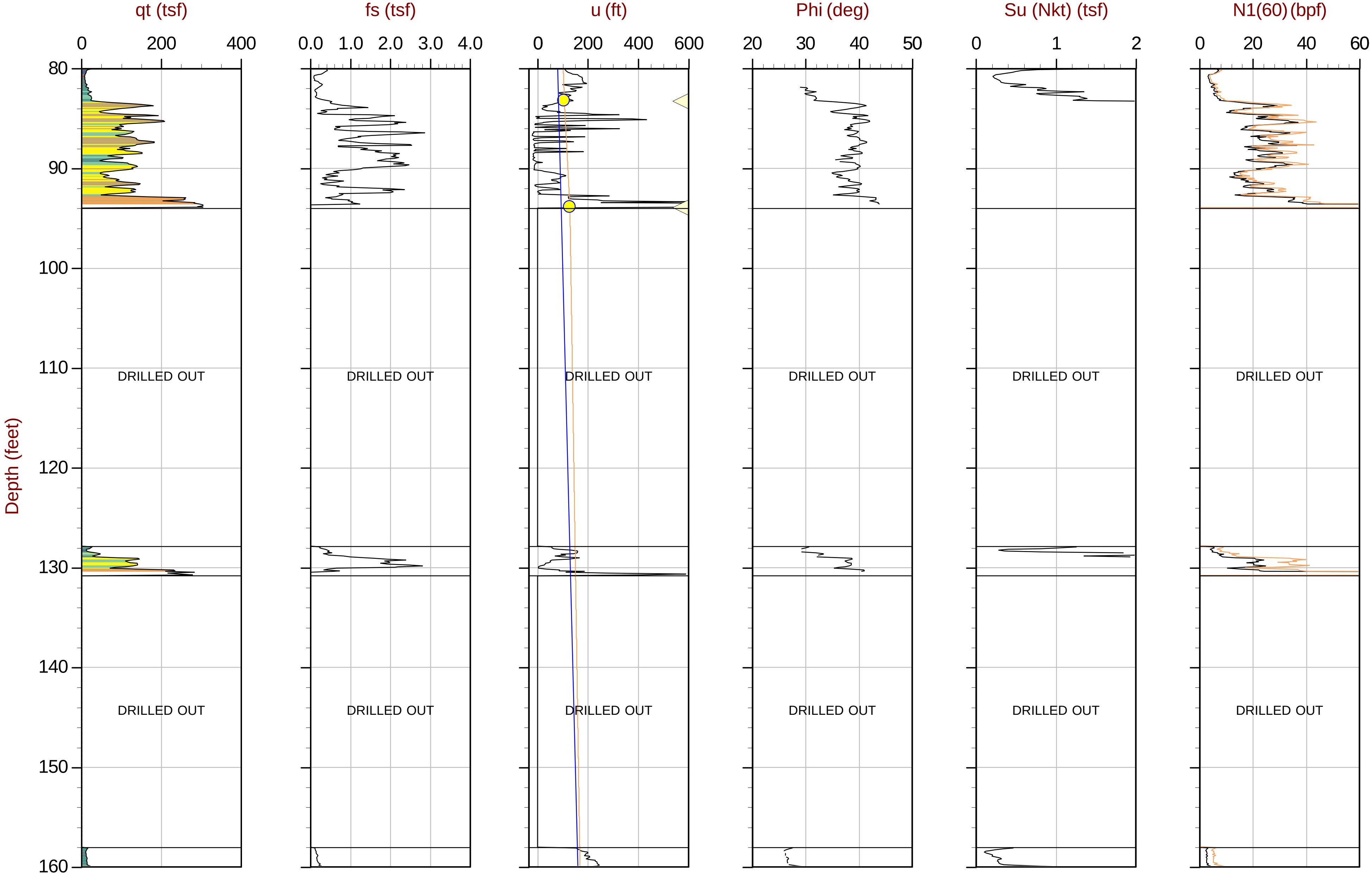
N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item: Assumed Ueq, Ueq

File: 17-51001_SP30.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved

Hydrostatic Line
Equilibrium profile

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 2 of 3

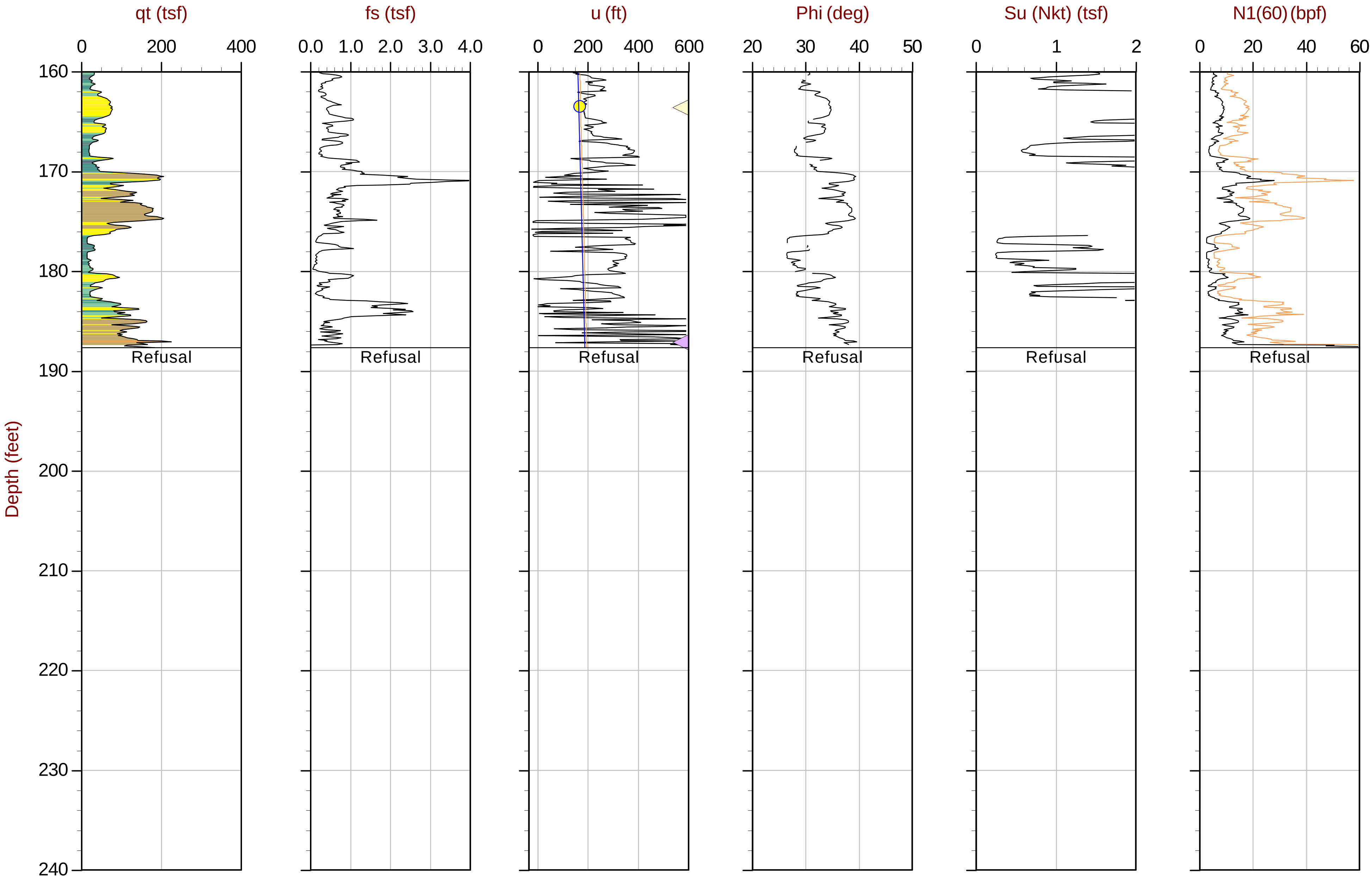
N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
Overplot Item:

File: 17-51001_SP30.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 3 of 3

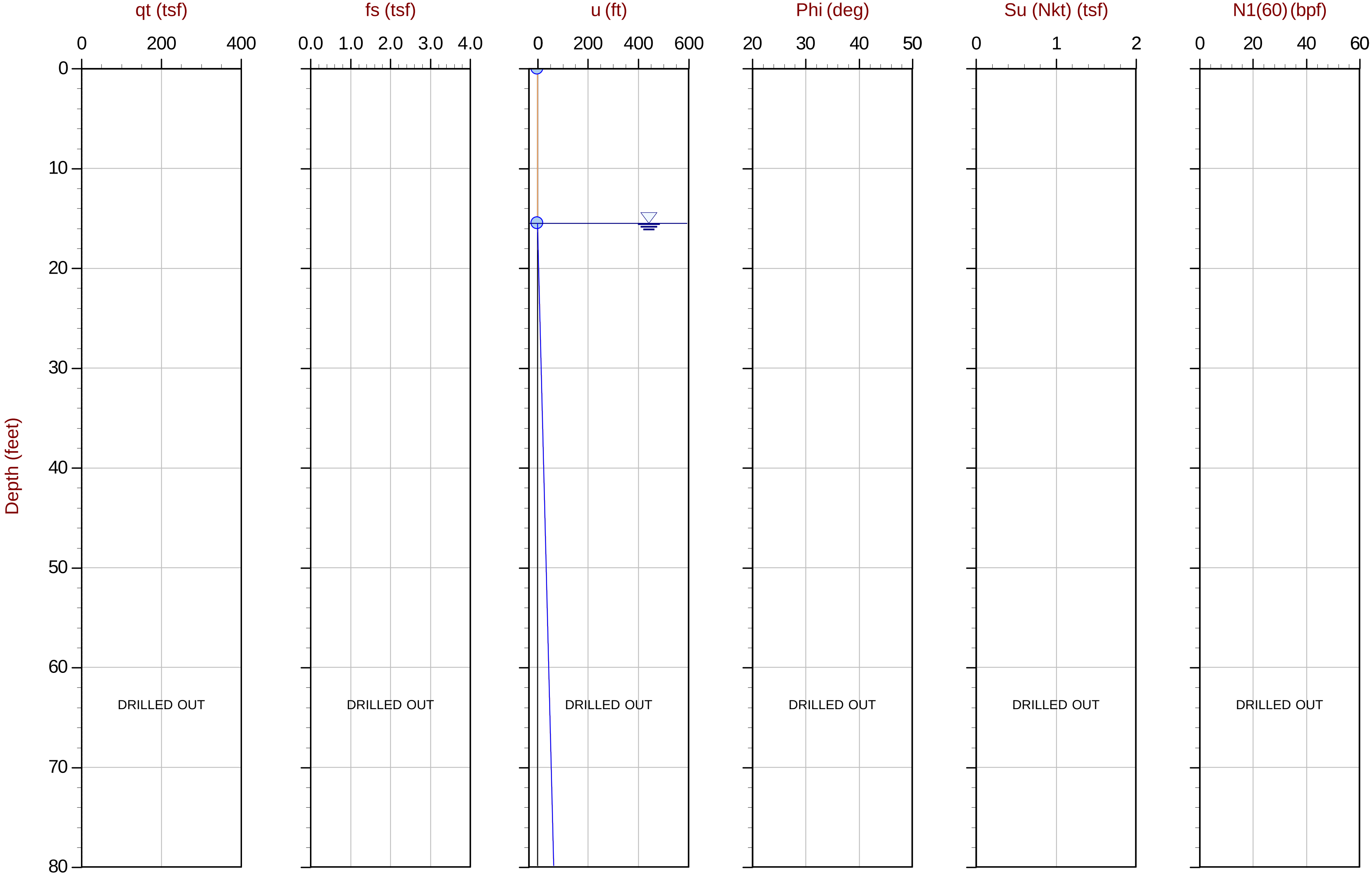
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line
Equilibrium profile
N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 1 of 3

N(60) (bpf)

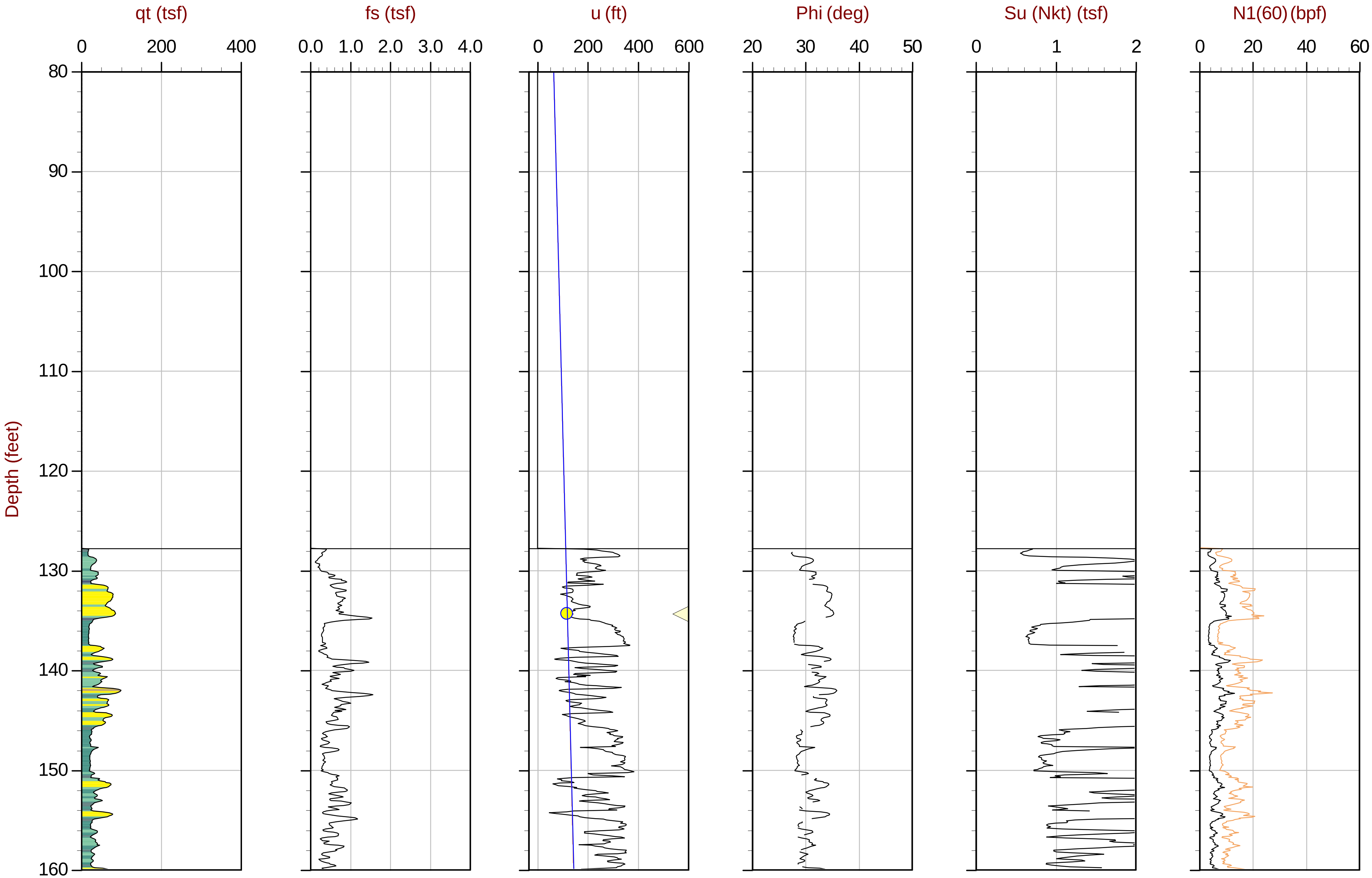
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 2 of 3

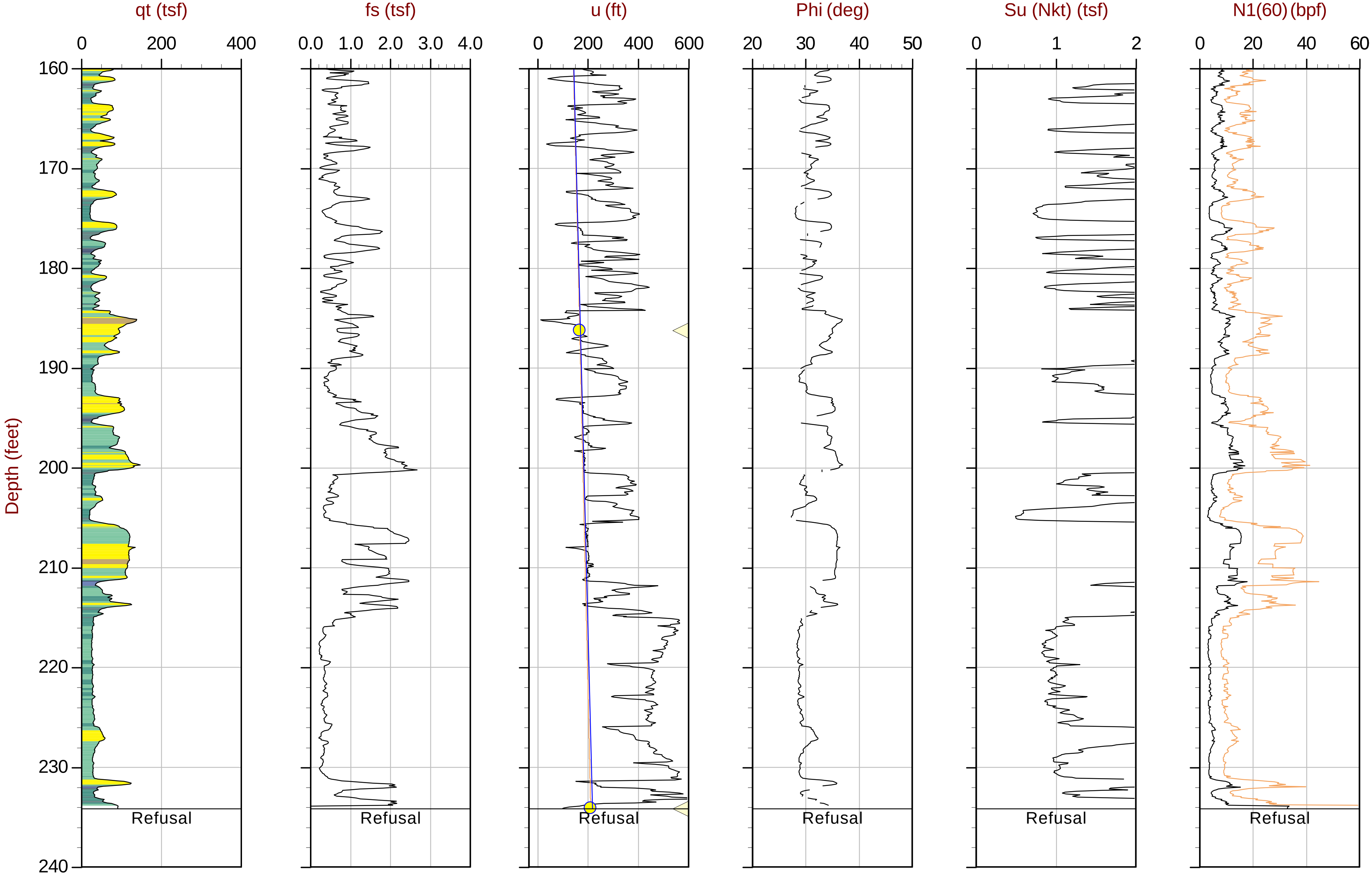
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile; N(60) (bpf)

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 3 of 3

N(60) (bpf)

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Hydrostatic Line; Equilibrium profile

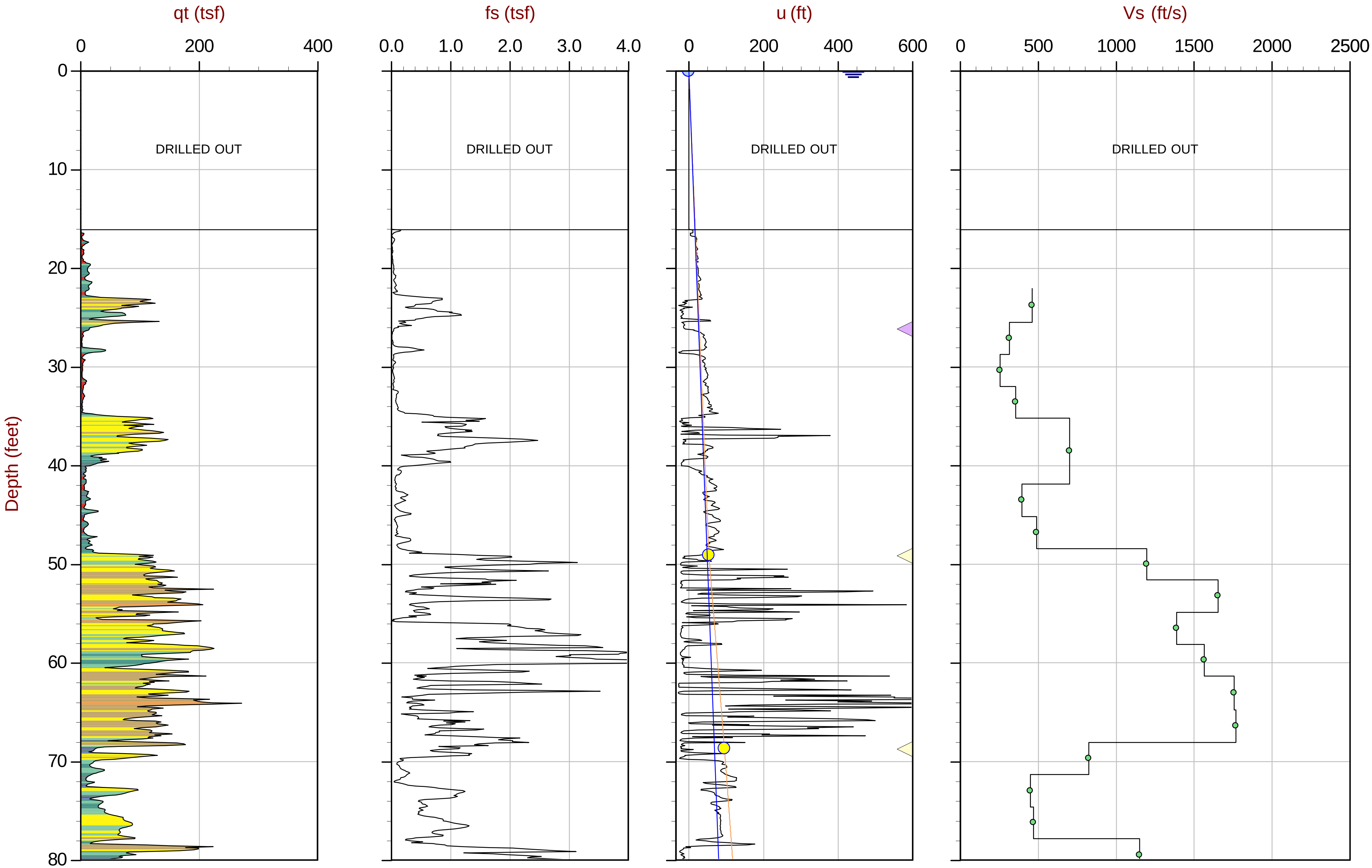
Cone Penetration Test Seismic Plots

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 1 of 4

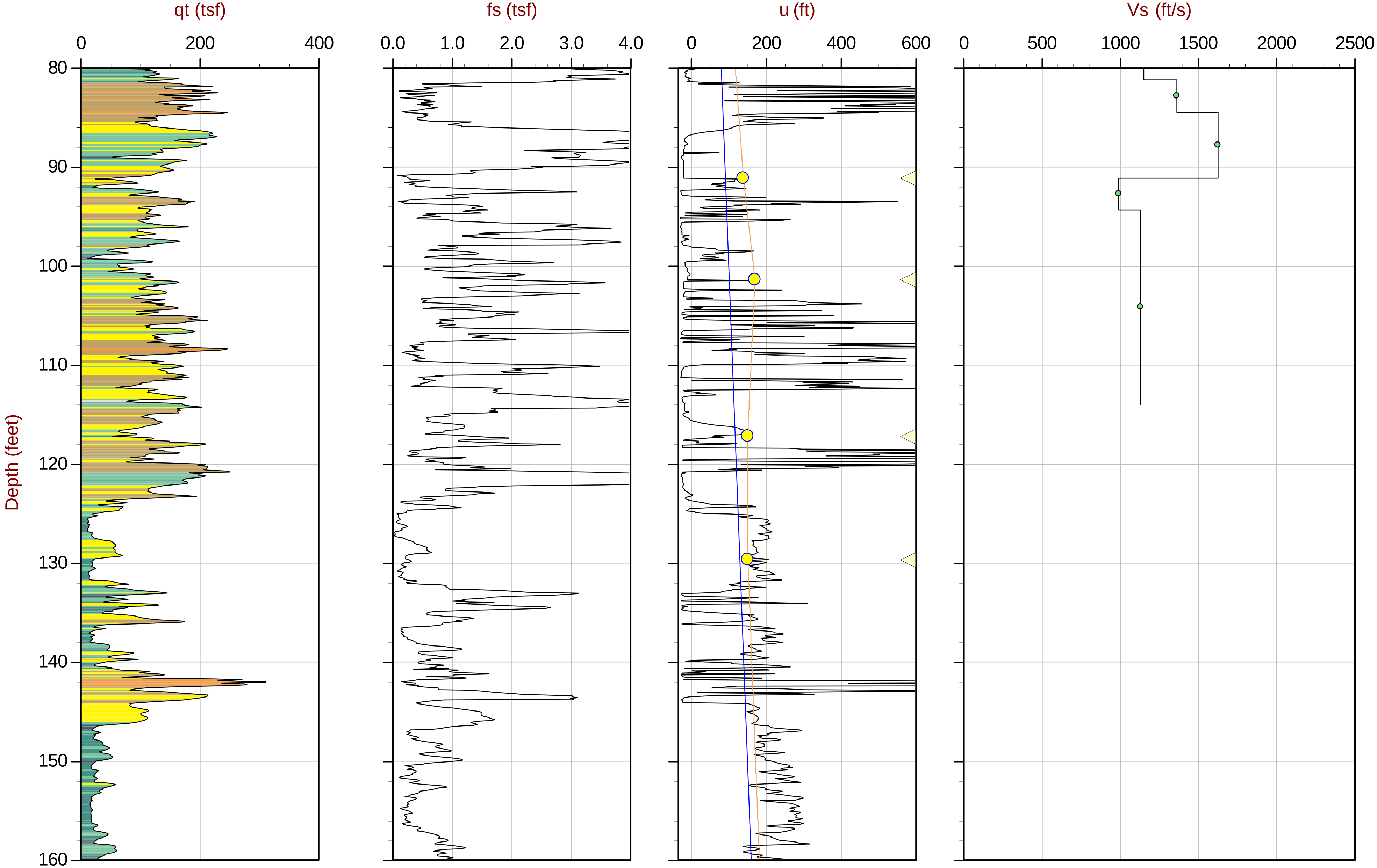
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 2 of 4

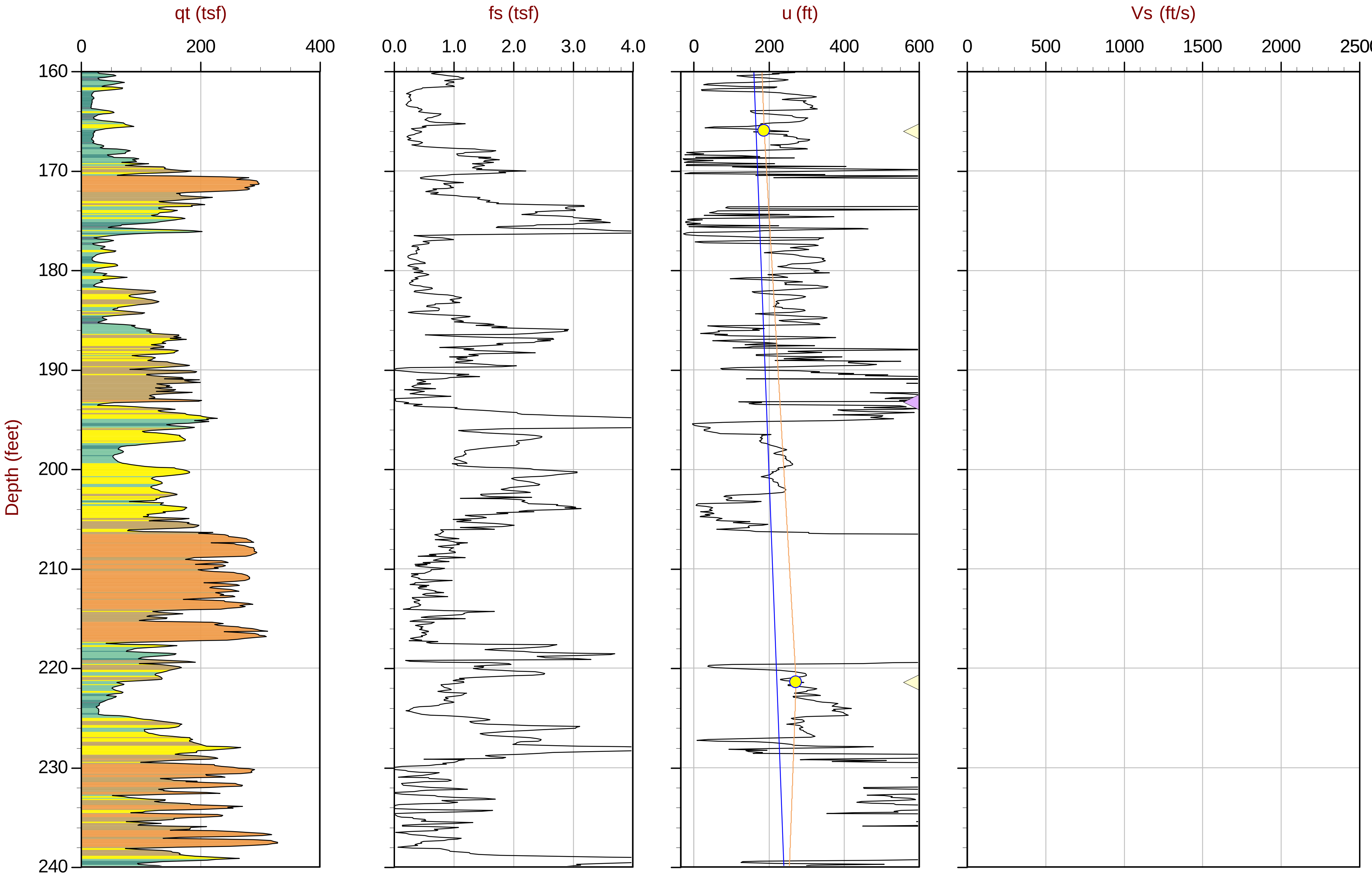
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

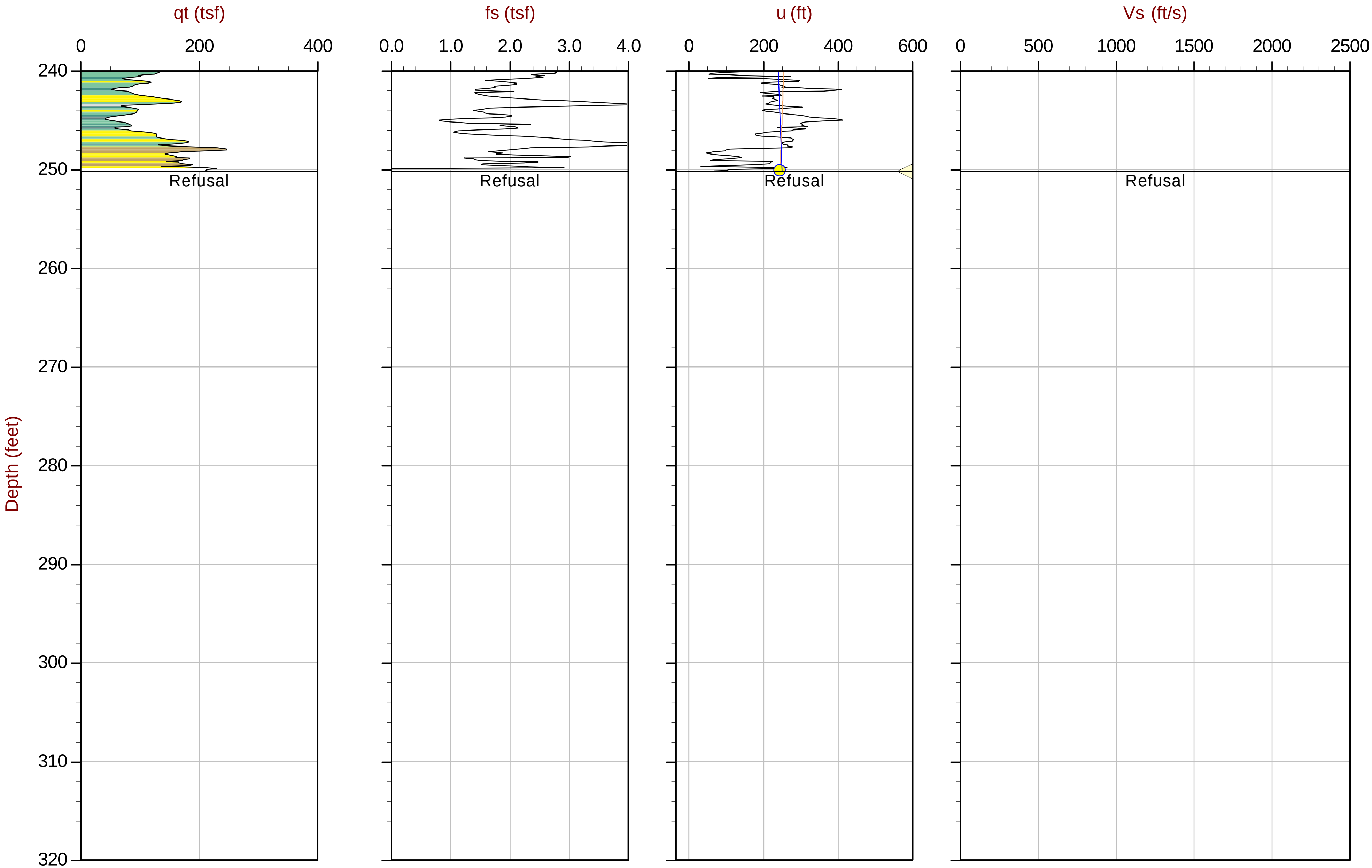
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 3 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K



Max Depth: 76.250 m / 250.16 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP23.COR
Unit Wt: SBT Zones

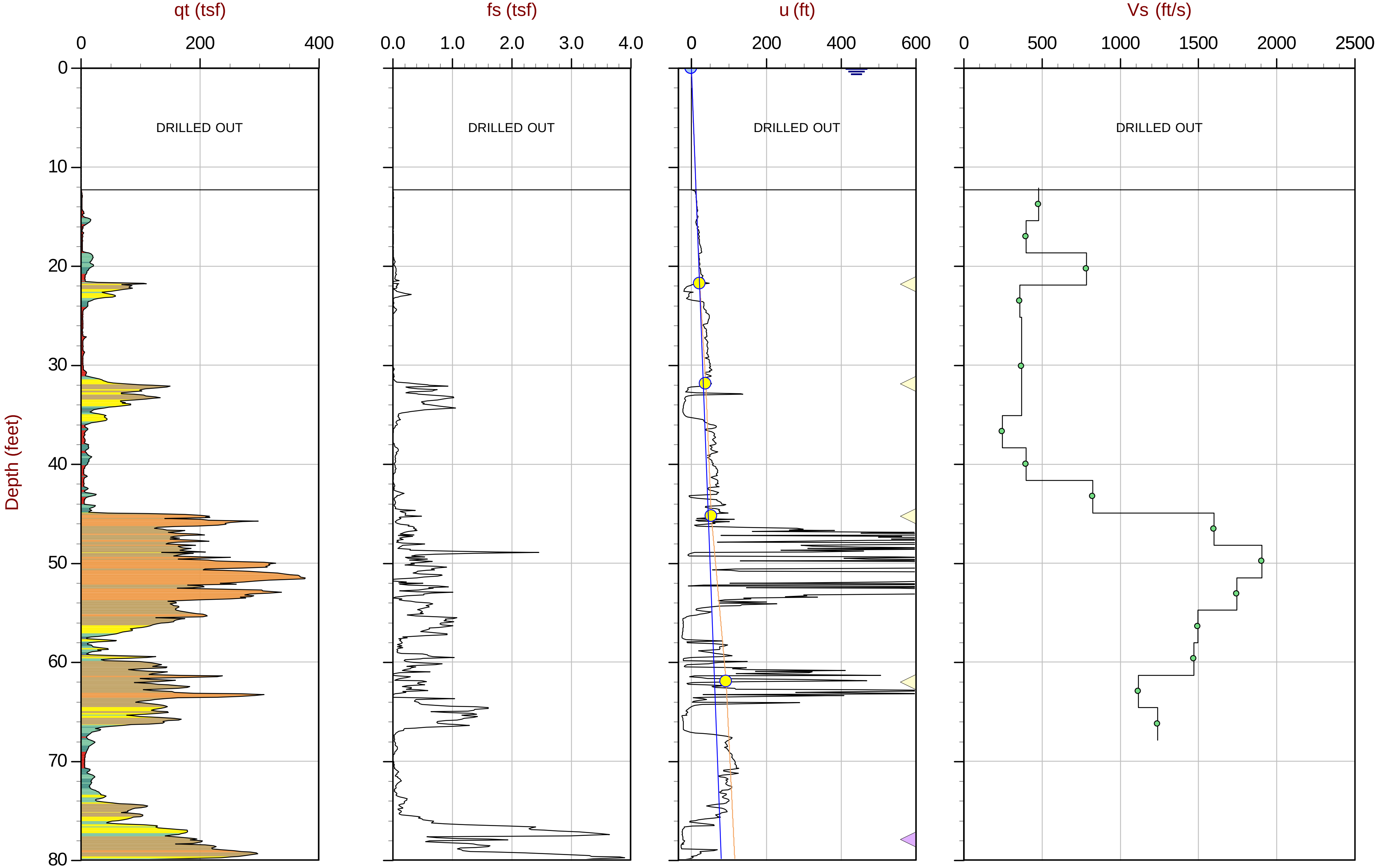
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208450m E: 484415m
Page No: 4 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 1 of 3

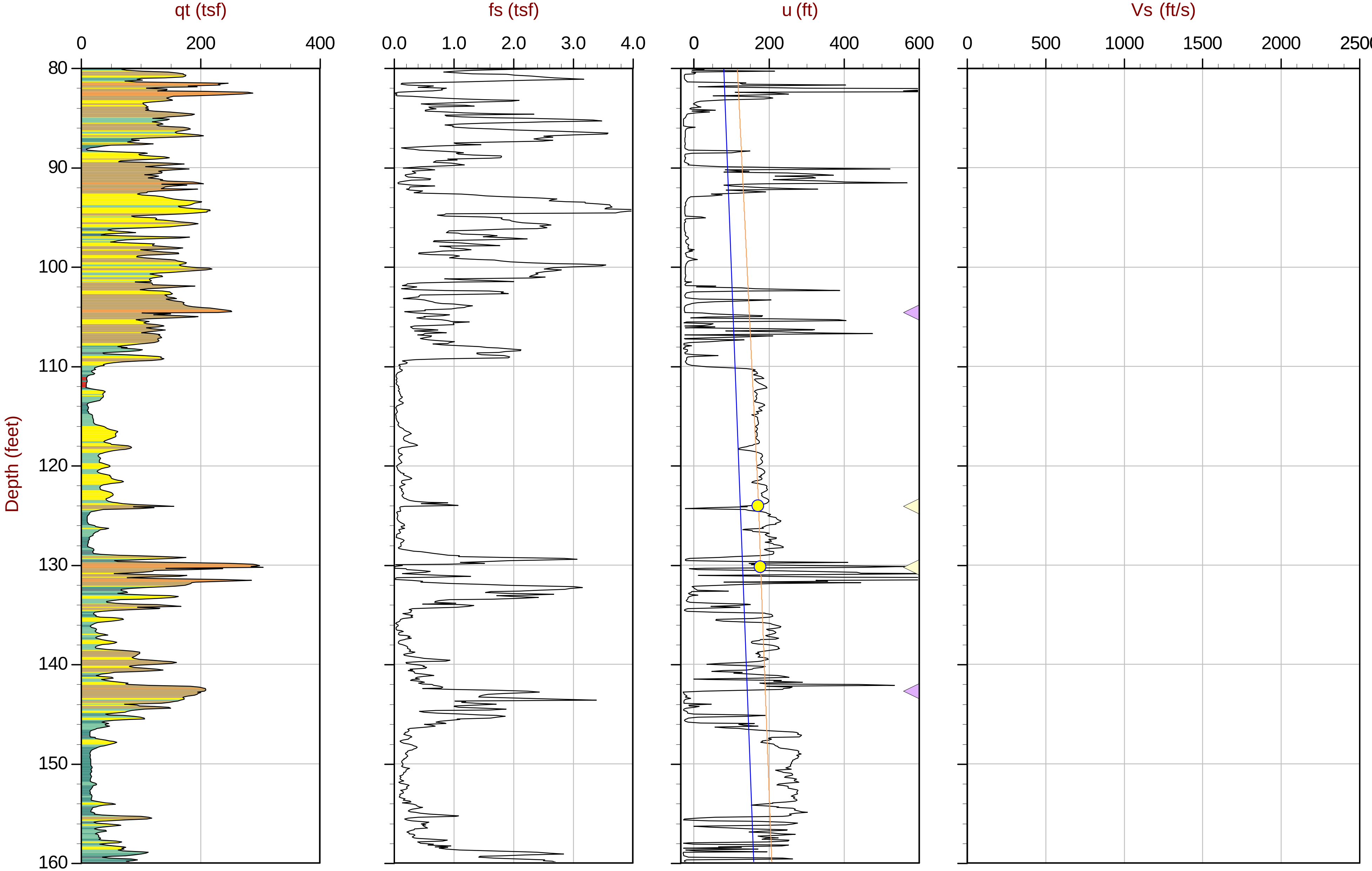
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 2 of 3

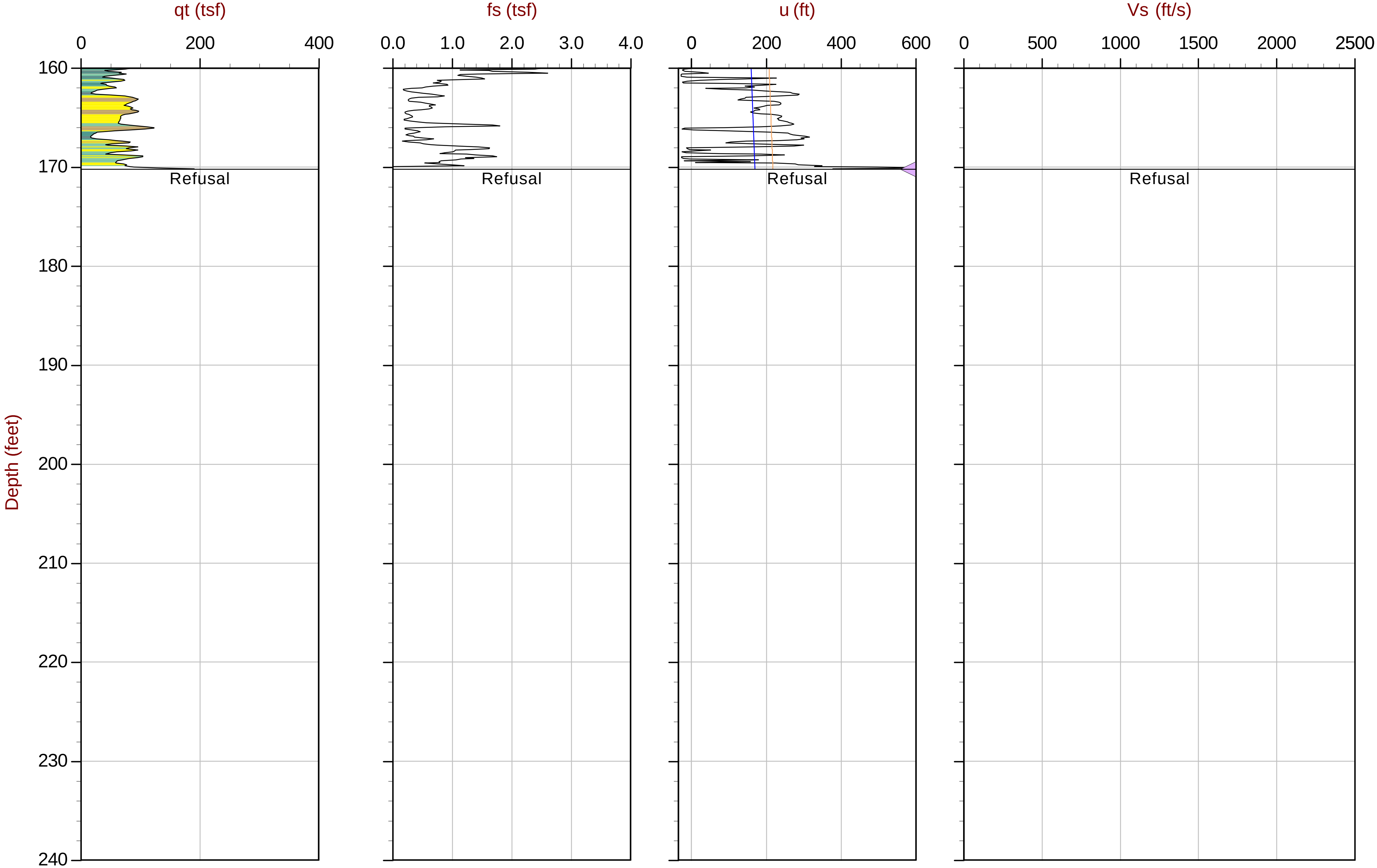
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:03:17 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K



Max Depth: 51.875 m / 170.19 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP24.COR
Unit Wt: SBT Zones

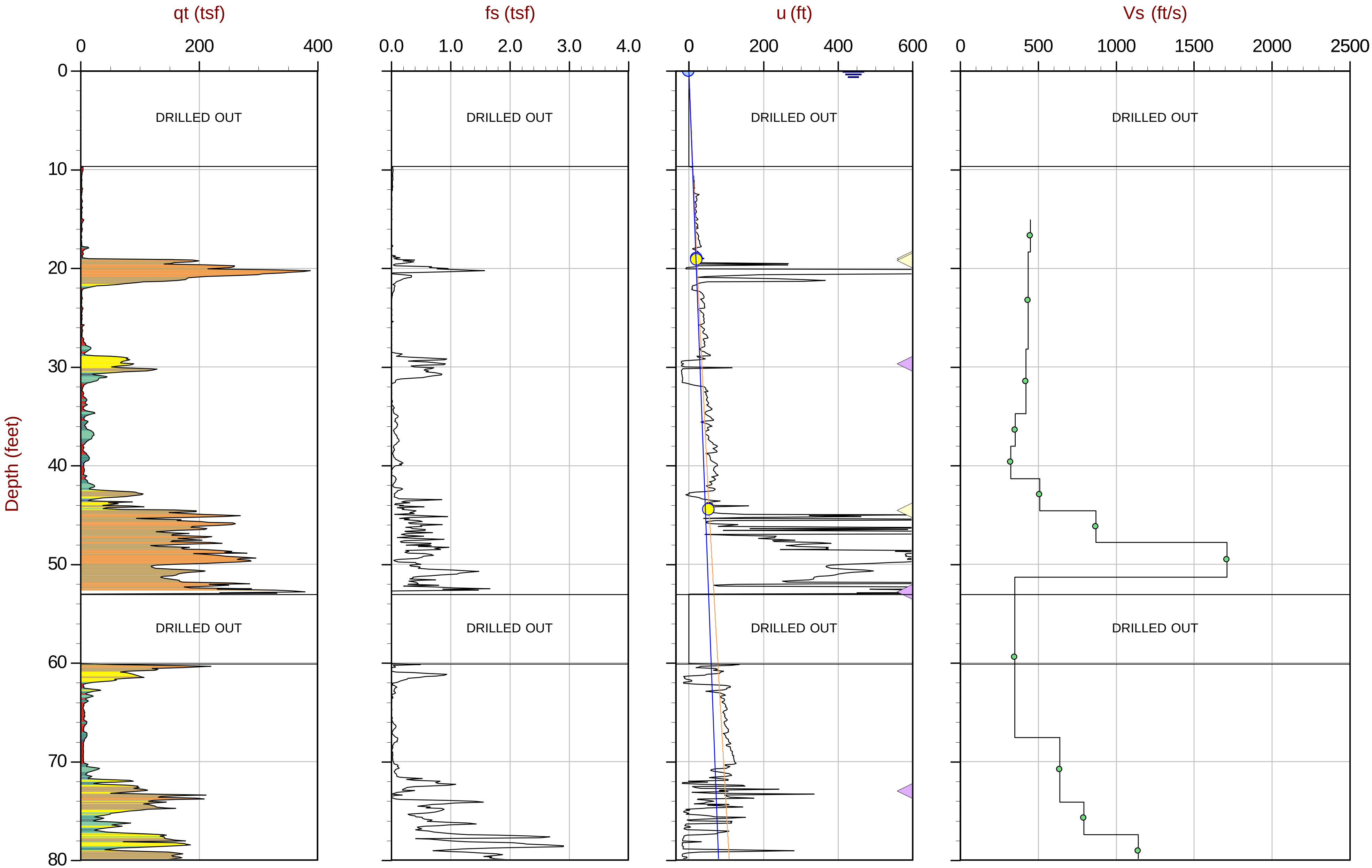
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208563m E: 484609m
Page No: 3 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 1 of 2

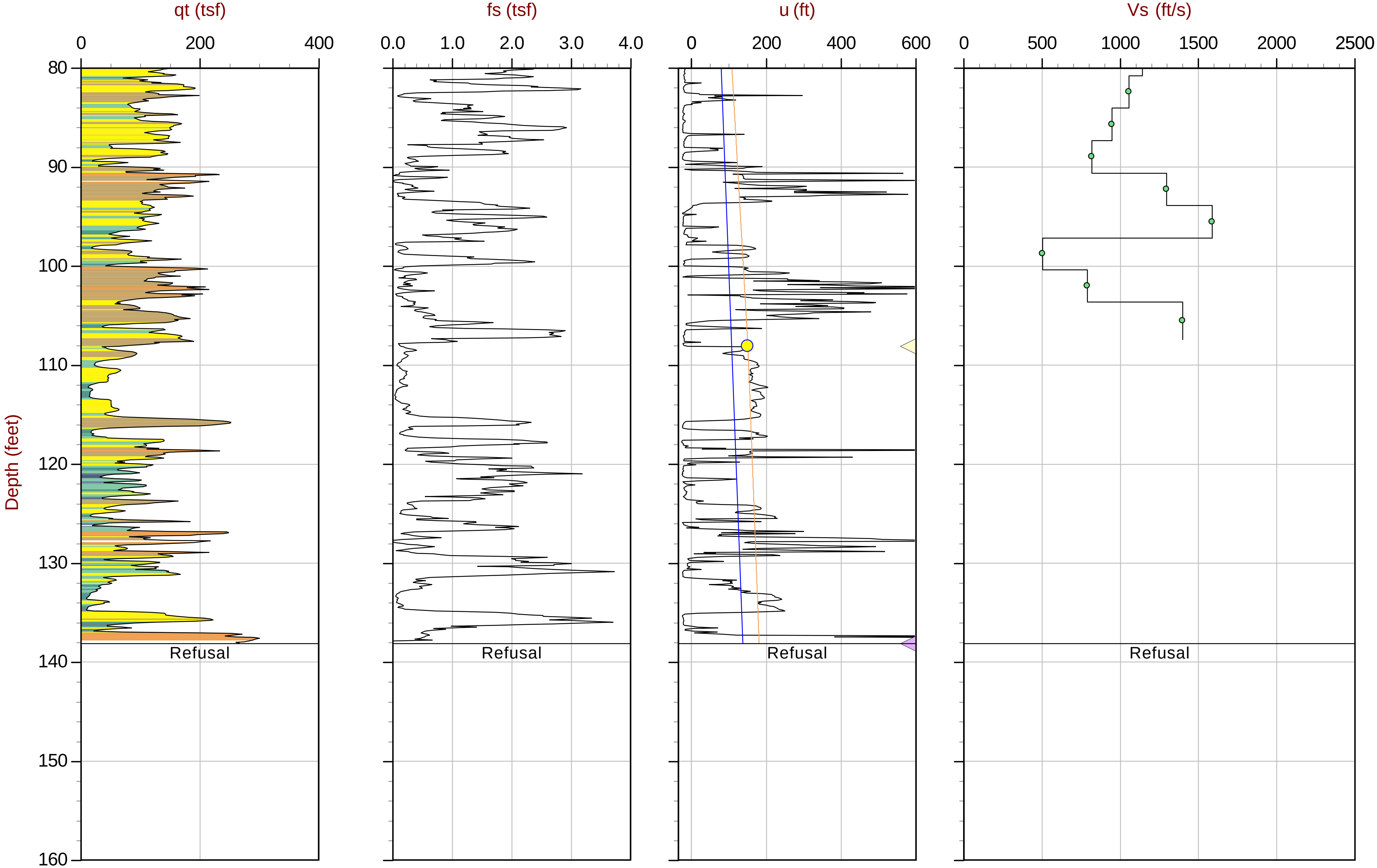
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:02:17 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500



Max Depth: 42.100 m / 138.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP25.COR
Unit Wt: SBT Zones

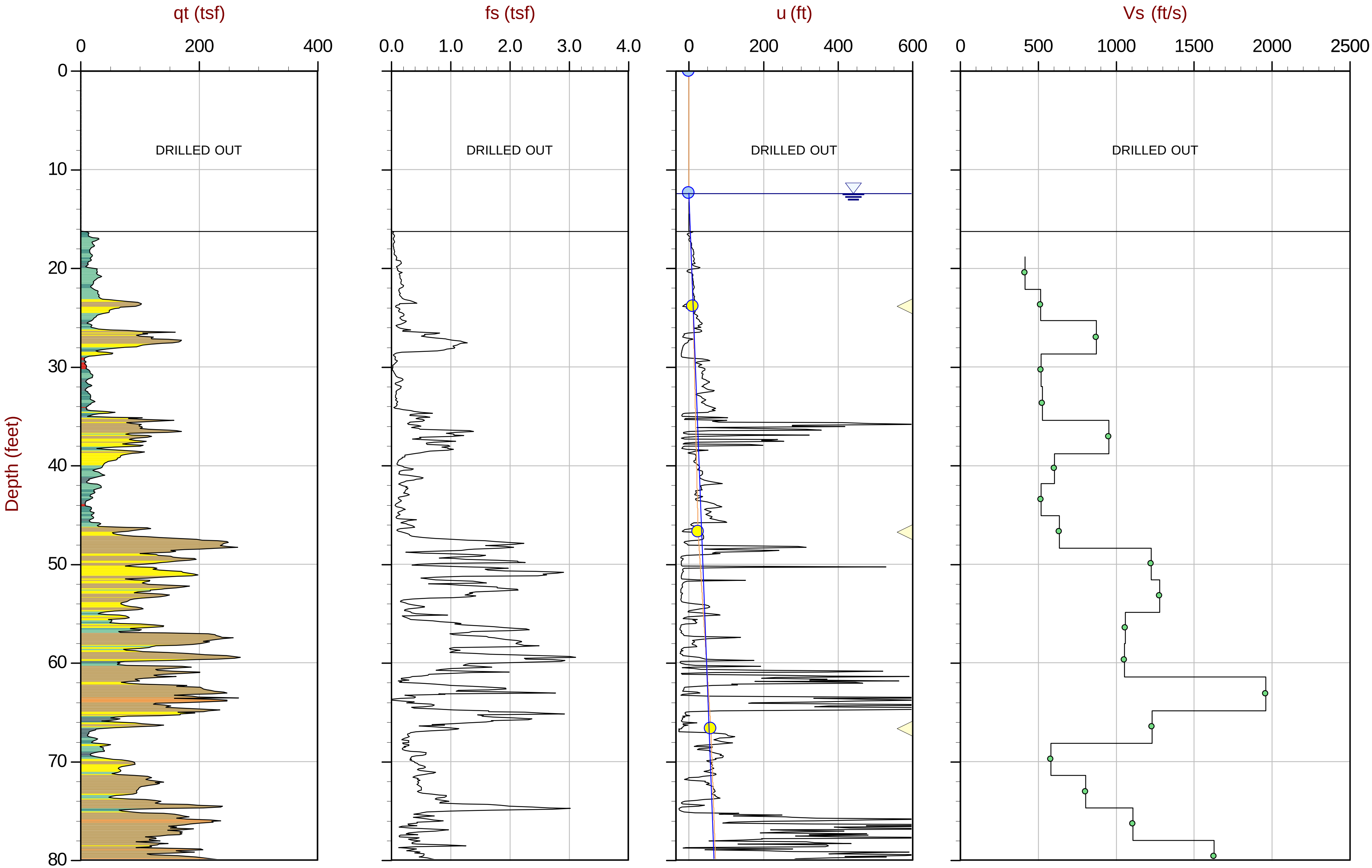
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208684m E: 484807m
Page No: 2 of 2

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

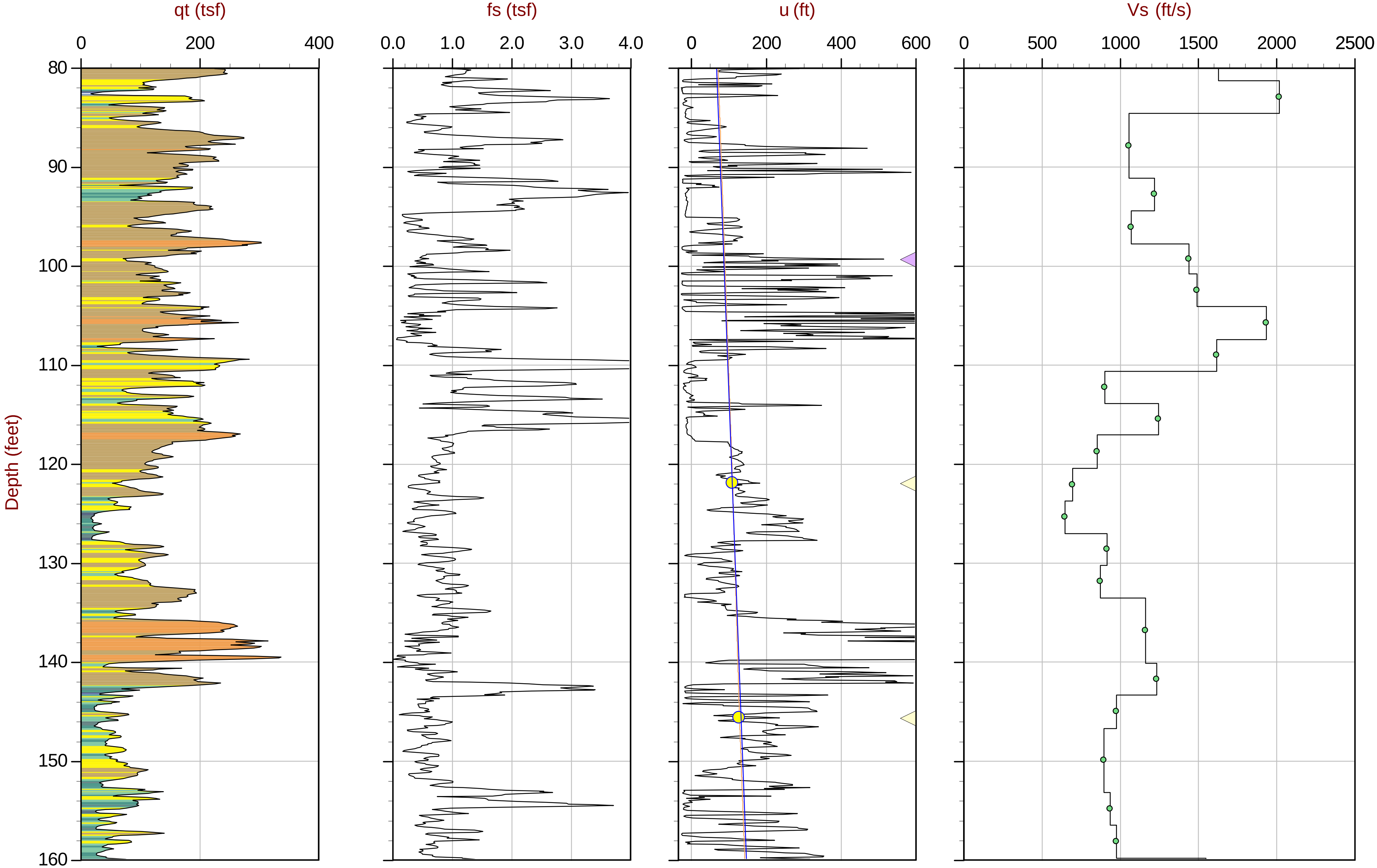
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 1 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 2 of 3

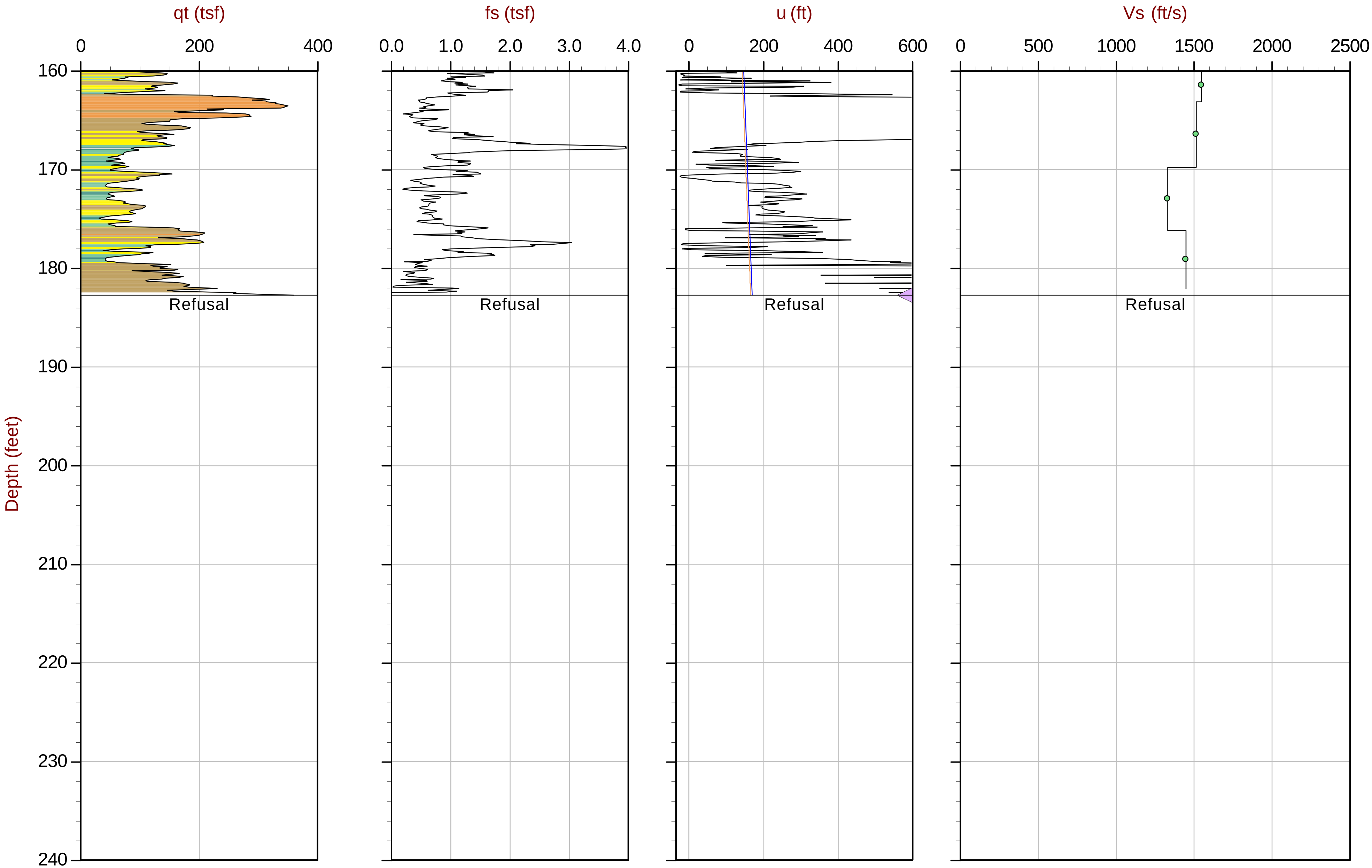
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:08:17 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K



Max Depth: 55.700 m / 182.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208576m E: 484223m
Page No: 3 of 3

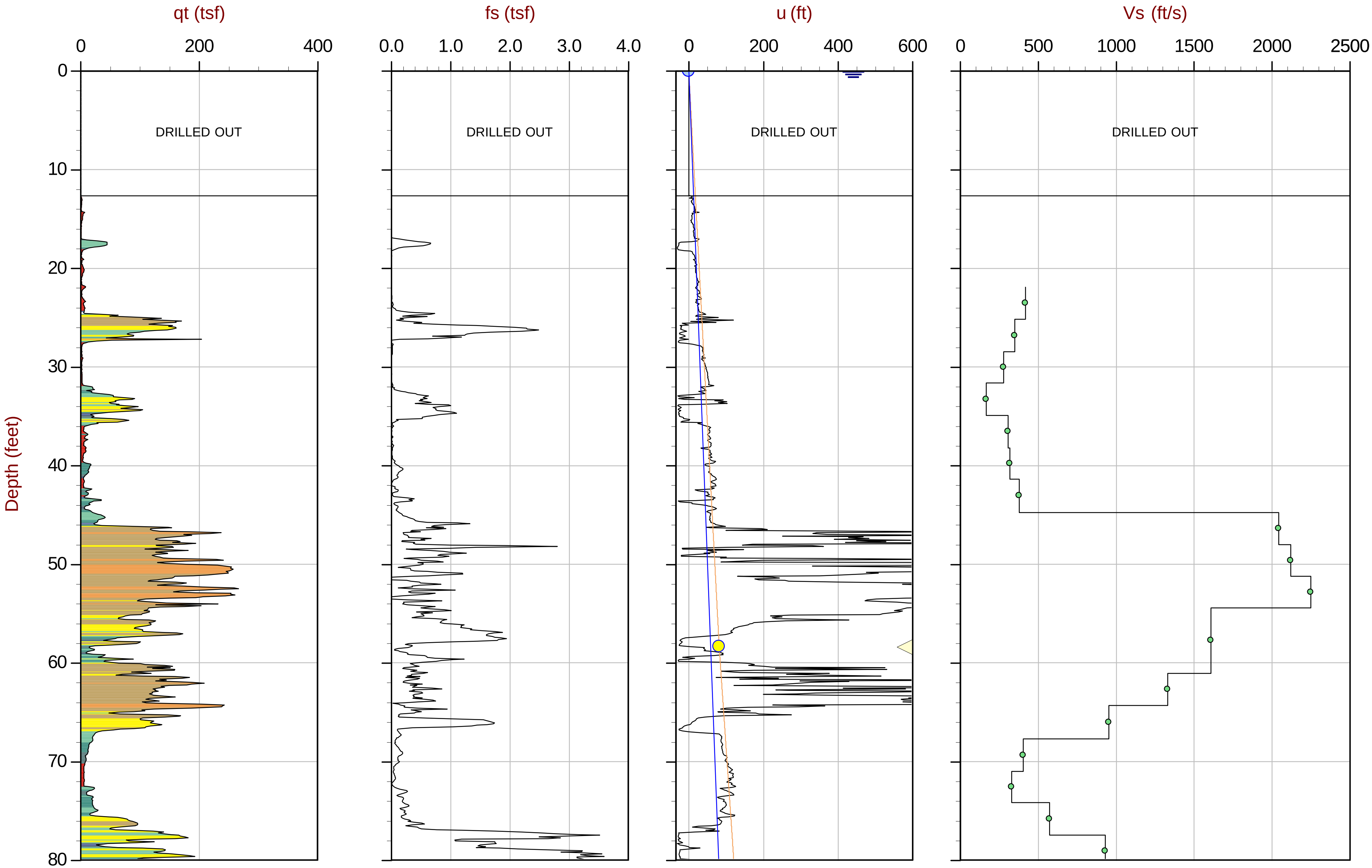
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 1 of 2

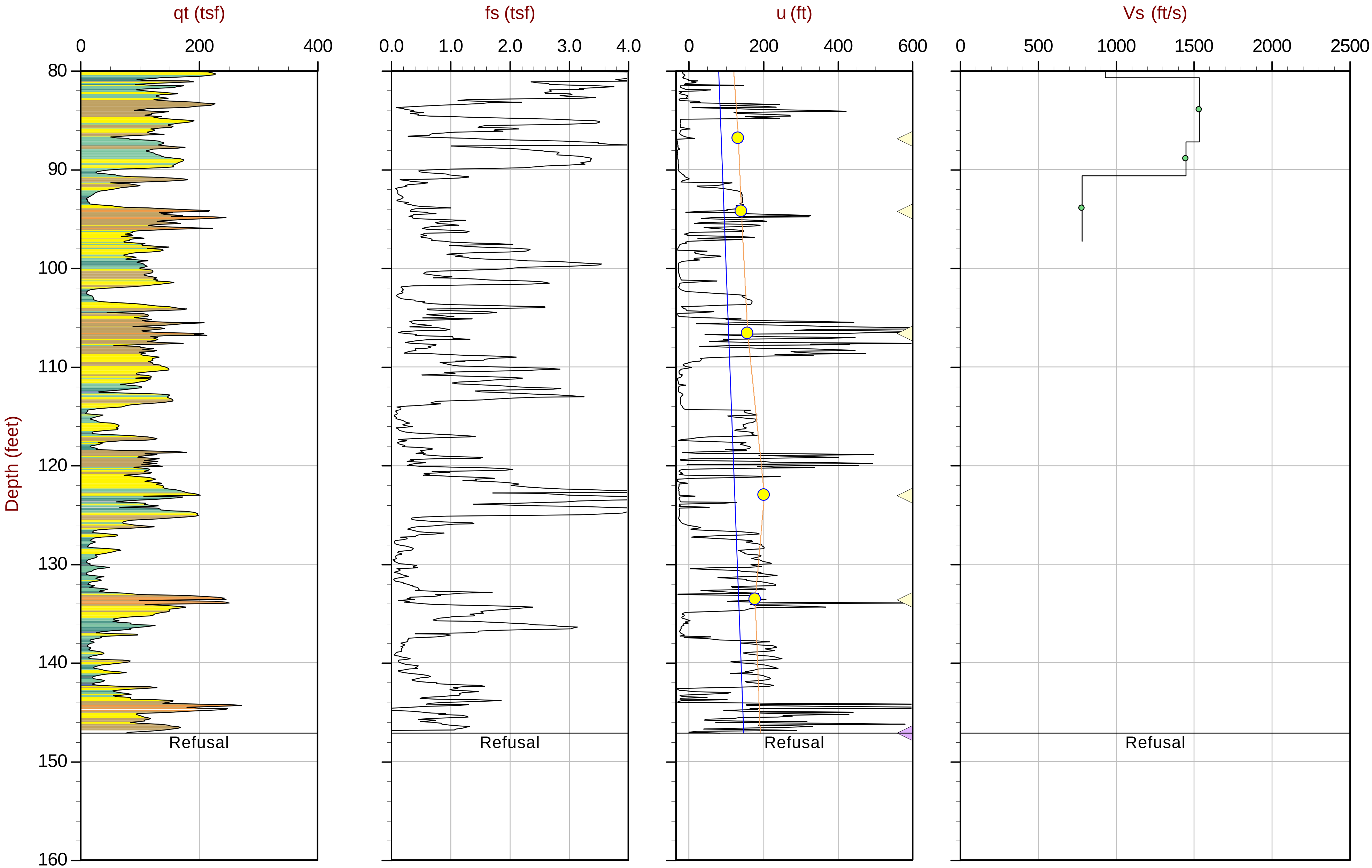
Overplot Item: Assumed Ueq, Ueq, Dissipation, equilibrium achieved, Dissipation, equilibrium not achieved, Equilibrium profile, Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:07:17 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K



Max Depth: 44.850 m / 147.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP27.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208469m E: 484643m
Page No: 2 of 2

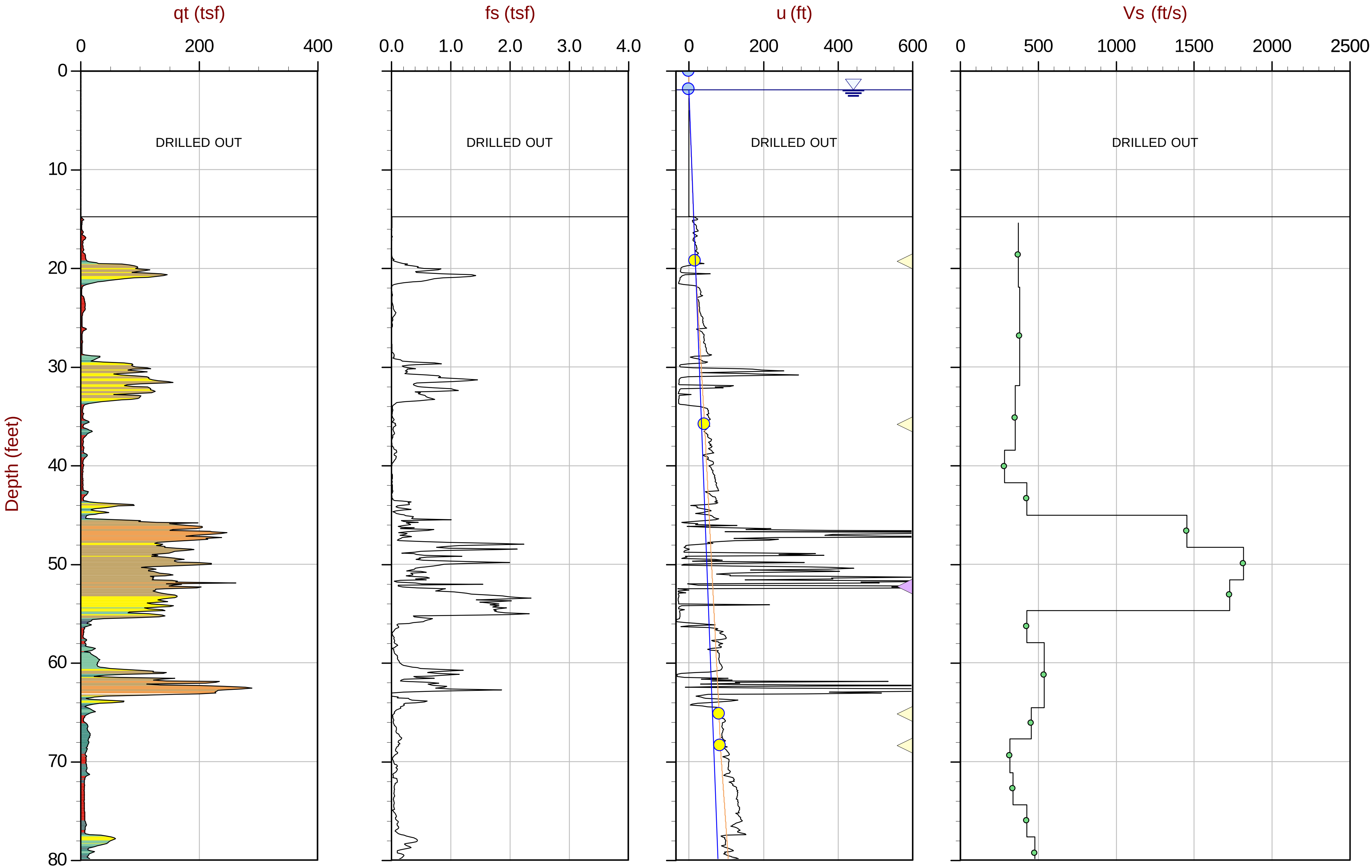
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 1 of 4

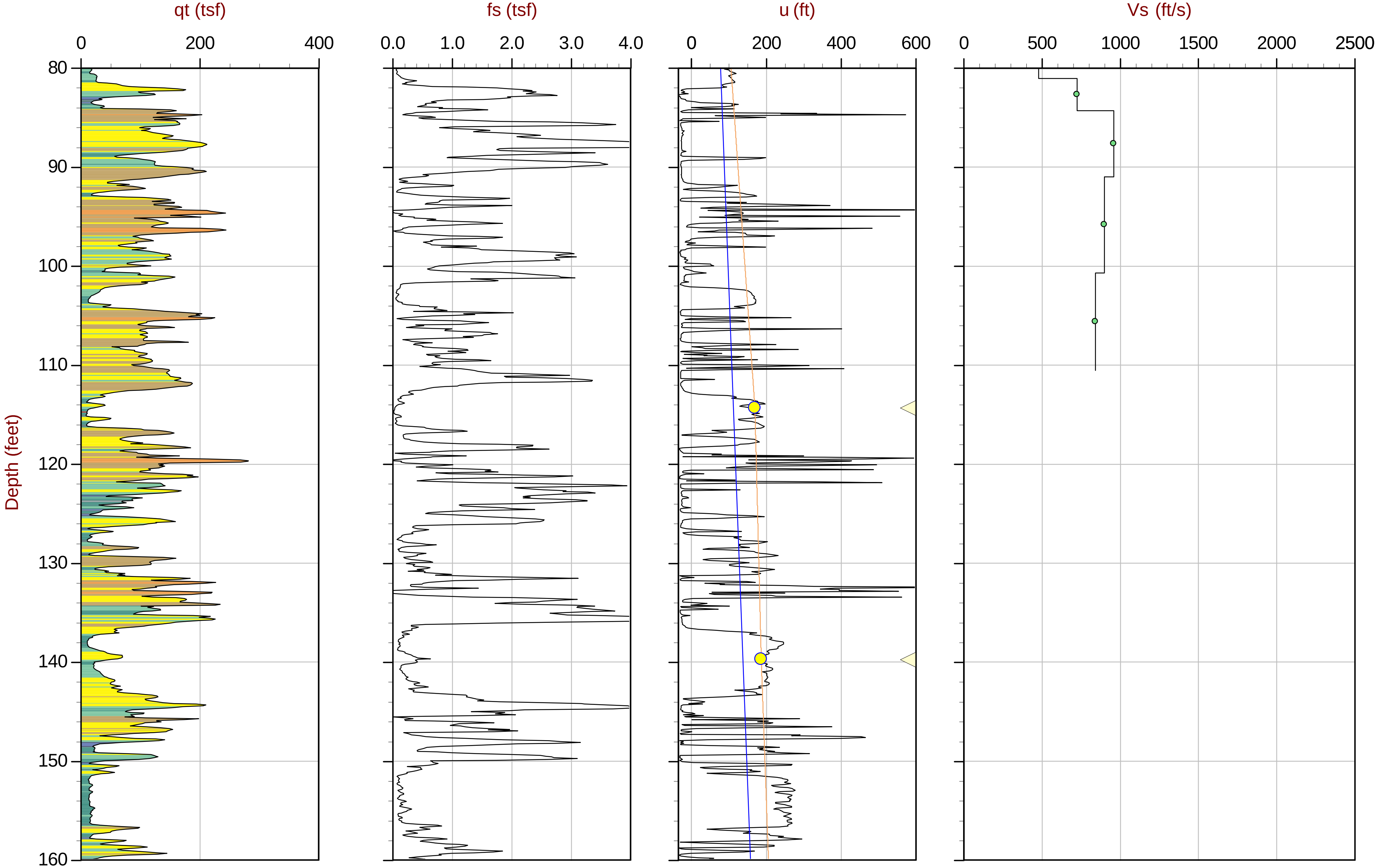
Overplot Item: Assumed Ueq, Ueq, Dissipation, equilibrium achieved, Dissipation, equilibrium not achieved, Equilibrium profile, Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 2 of 4

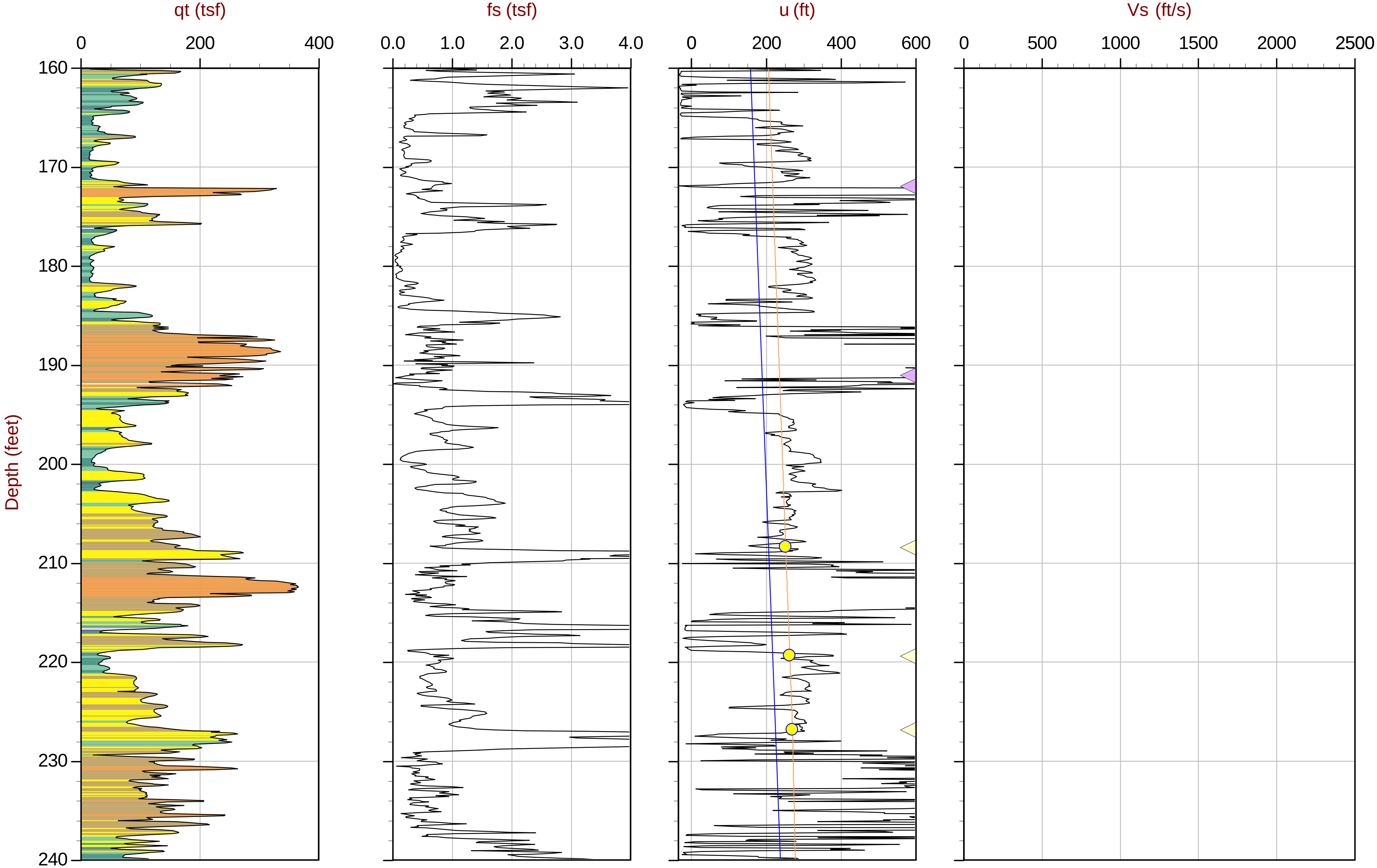
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

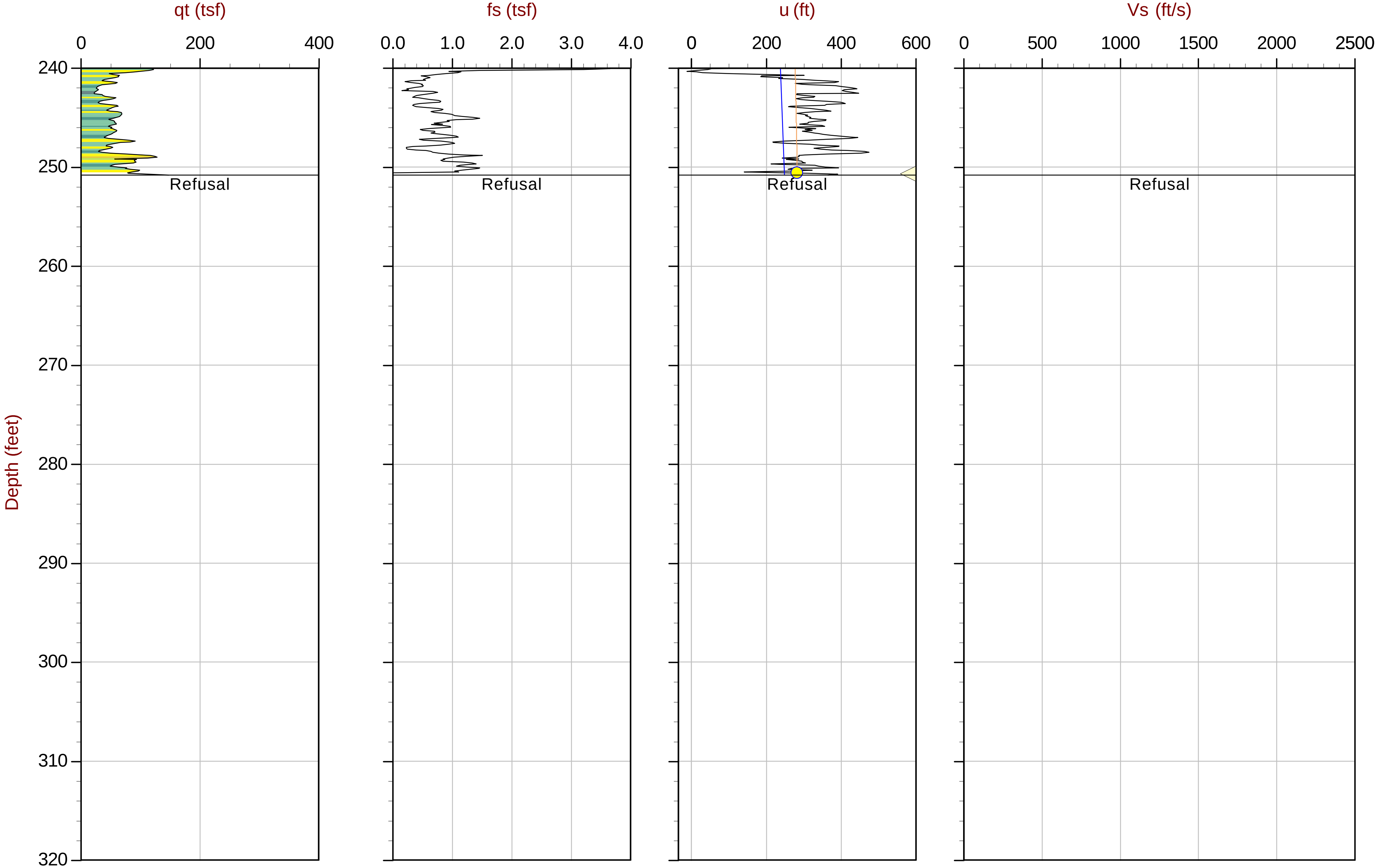
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 3 of 4

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:06:17 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K



Max Depth: 76.450 m / 250.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP28.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208485m E: 484932m
Page No: 4 of 4

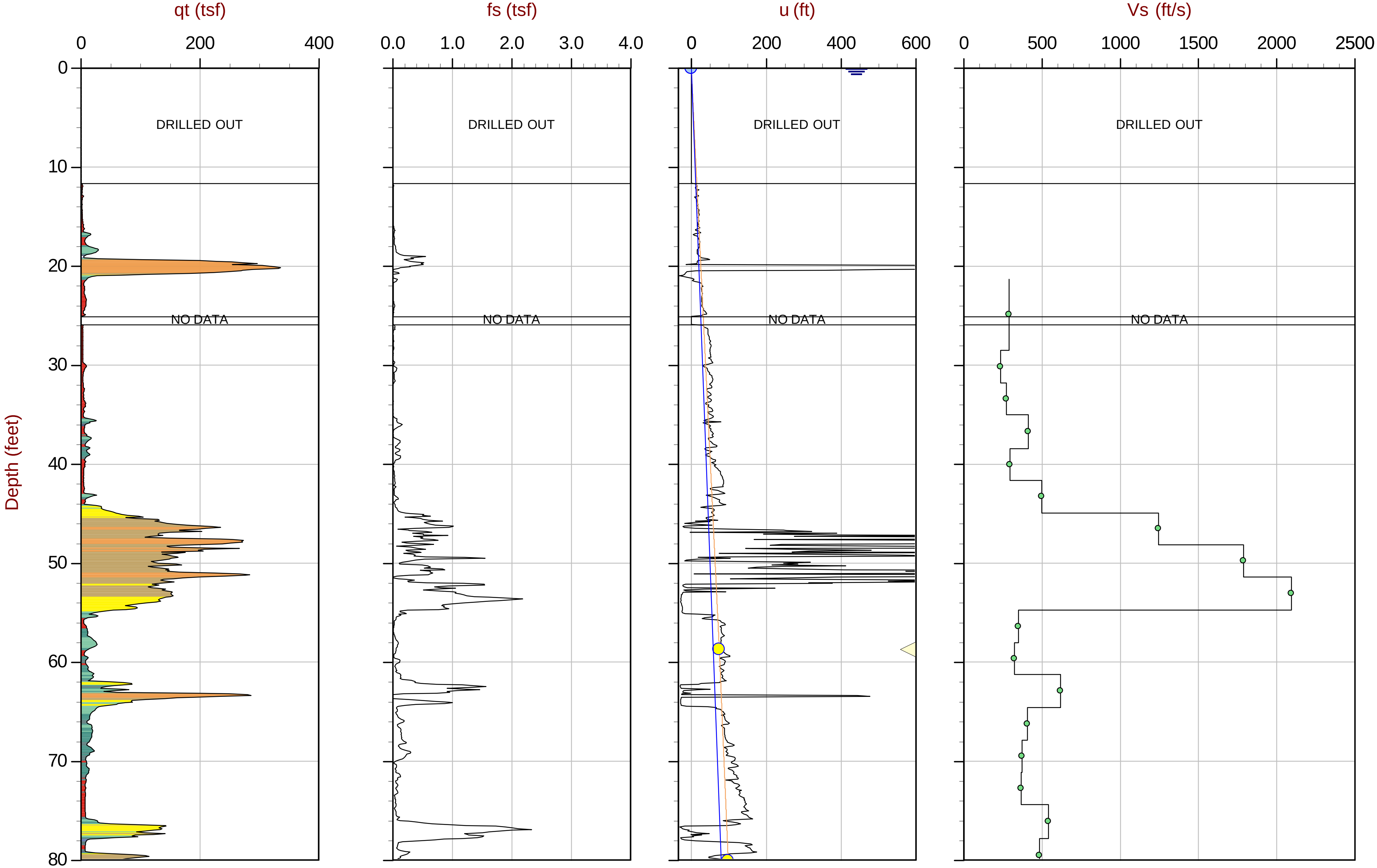
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 1 of 3

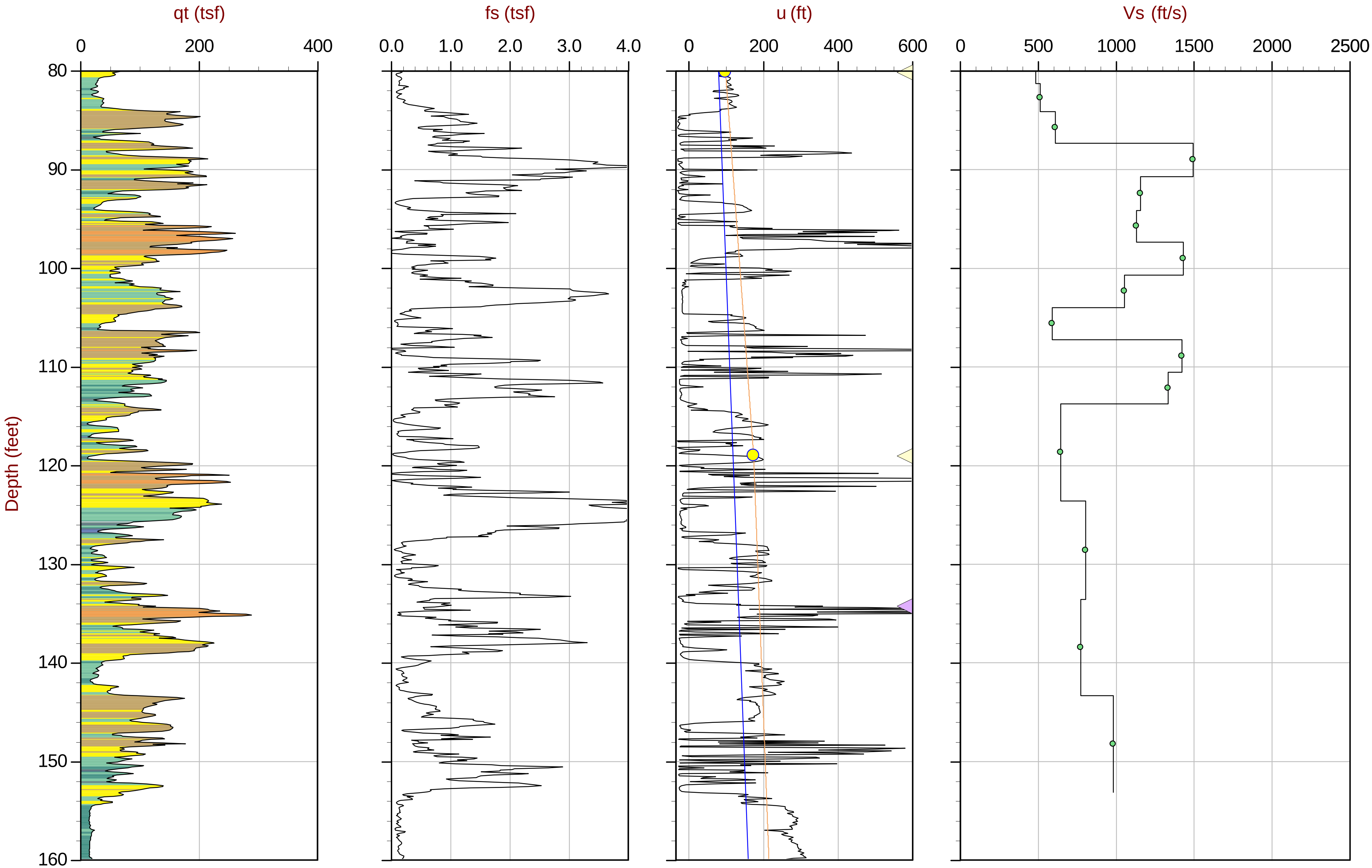
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K



Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

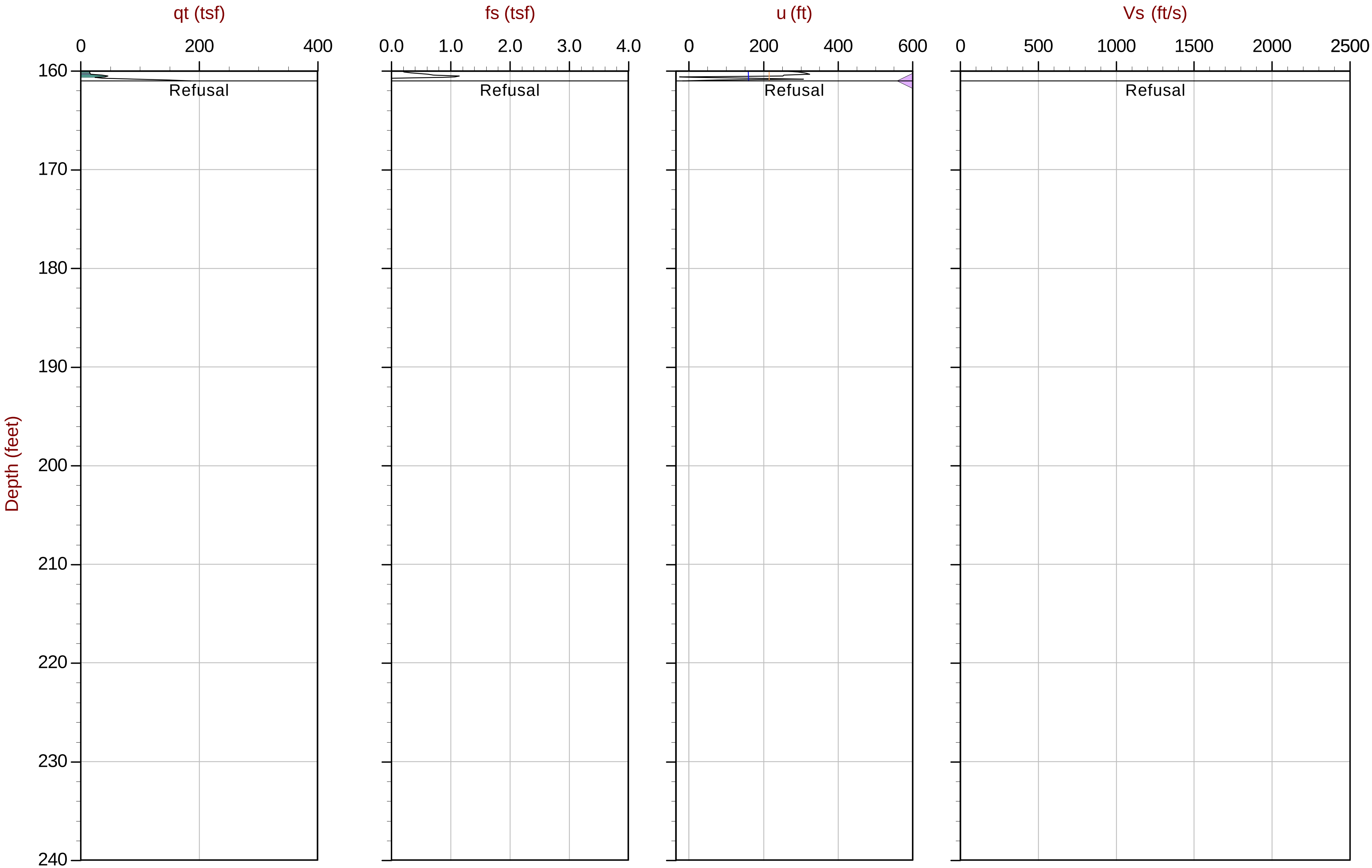
File: 17-51001_SP29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 2 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:04:17 02:20
Site: Fort Knox TSF
Sounding: SCPT17-29
Cone: 473:T1500F15U1K



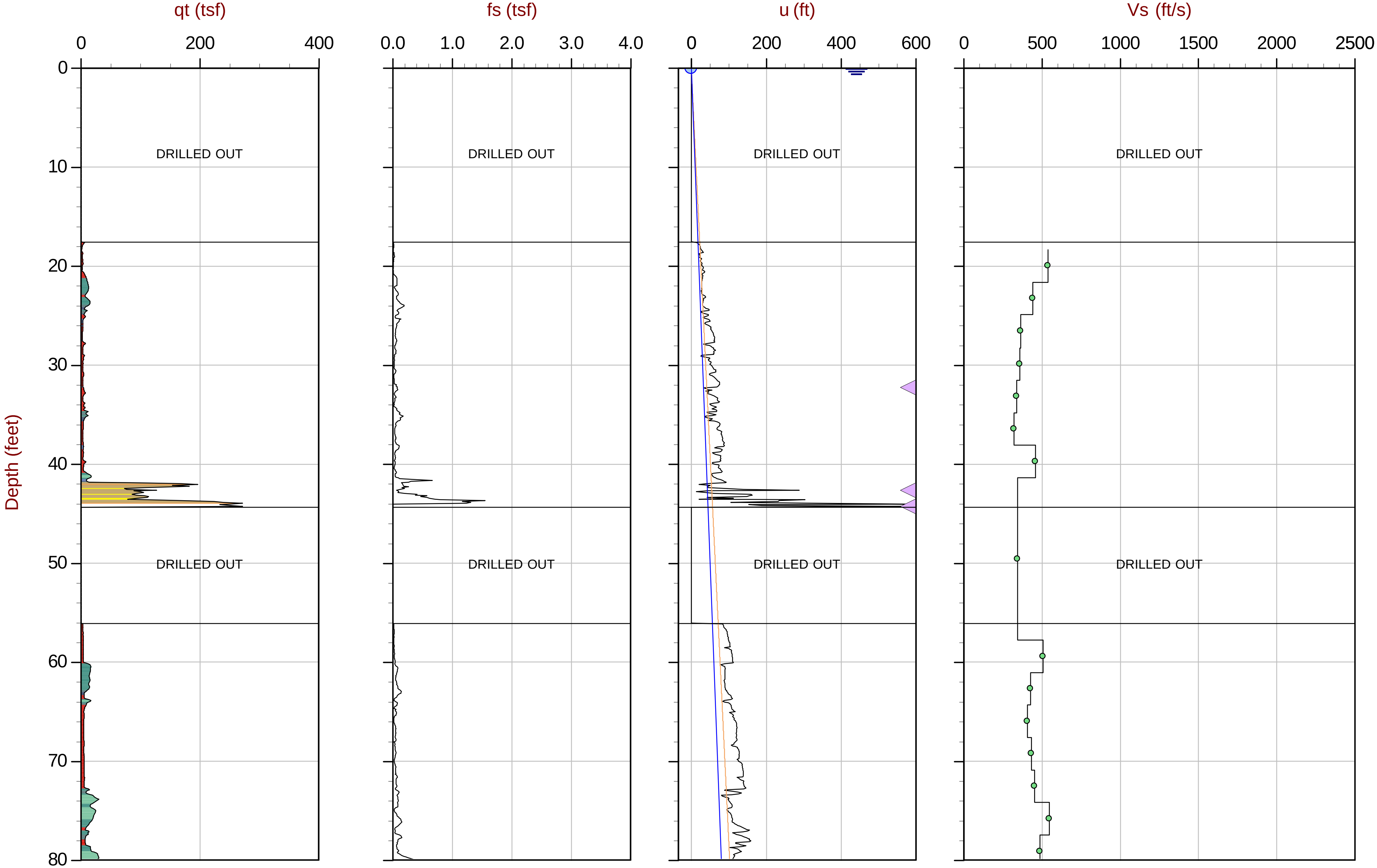
Max Depth: 49.075 m / 161.01 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
File: 17-51001_SP29.COR
Unit Wt: SBT Zones
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208504m E: 485096m
Page No: 3 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF
Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
File: 17-51001_SP30.COR
Unit Wt: SBT Zones
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 1 of 3

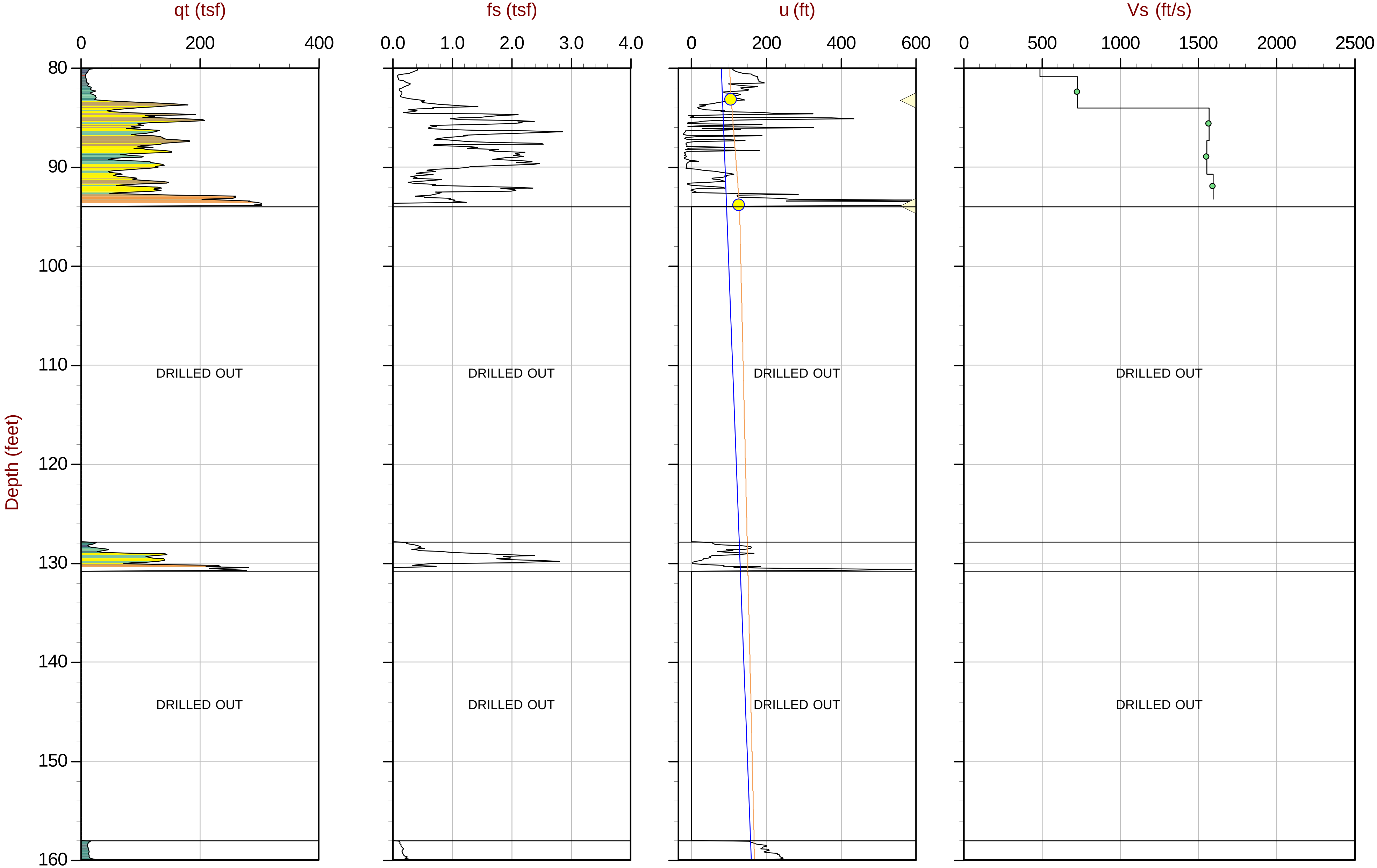
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 2 of 3

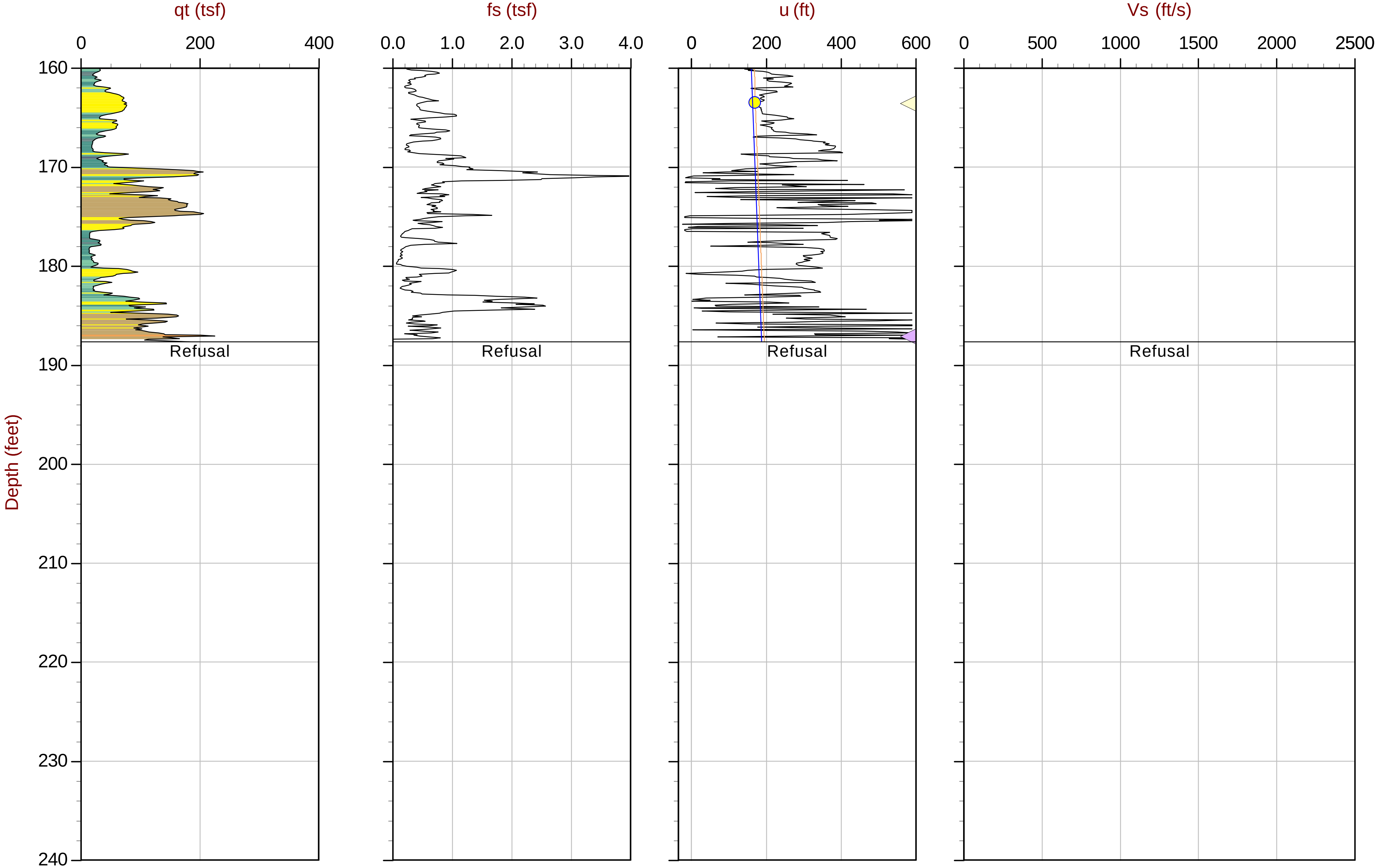
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02:28:17 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200



Max Depth: 57.200 m / 187.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP30.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208522m E: 485328m
Page No: 3 of 3

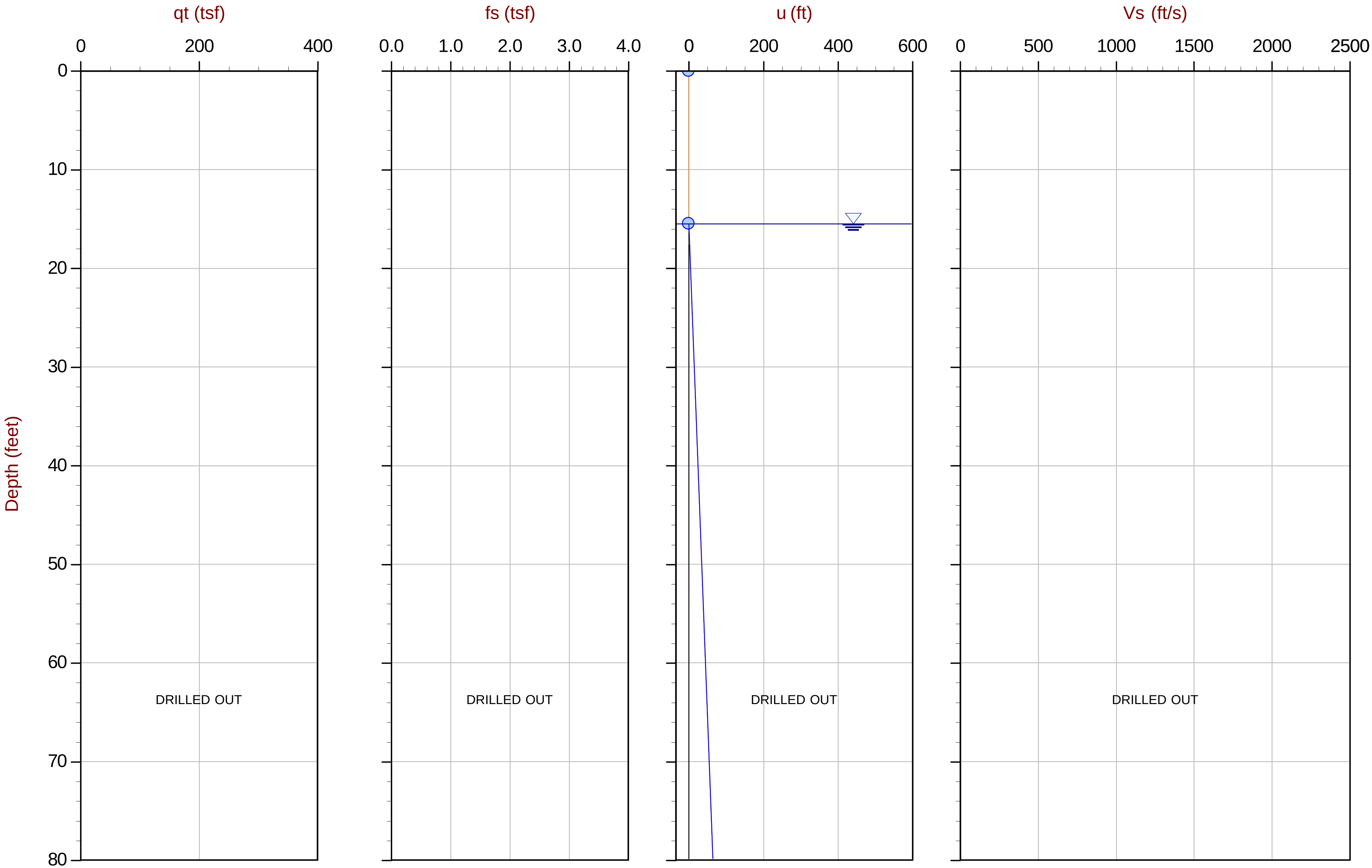
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 1 of 3

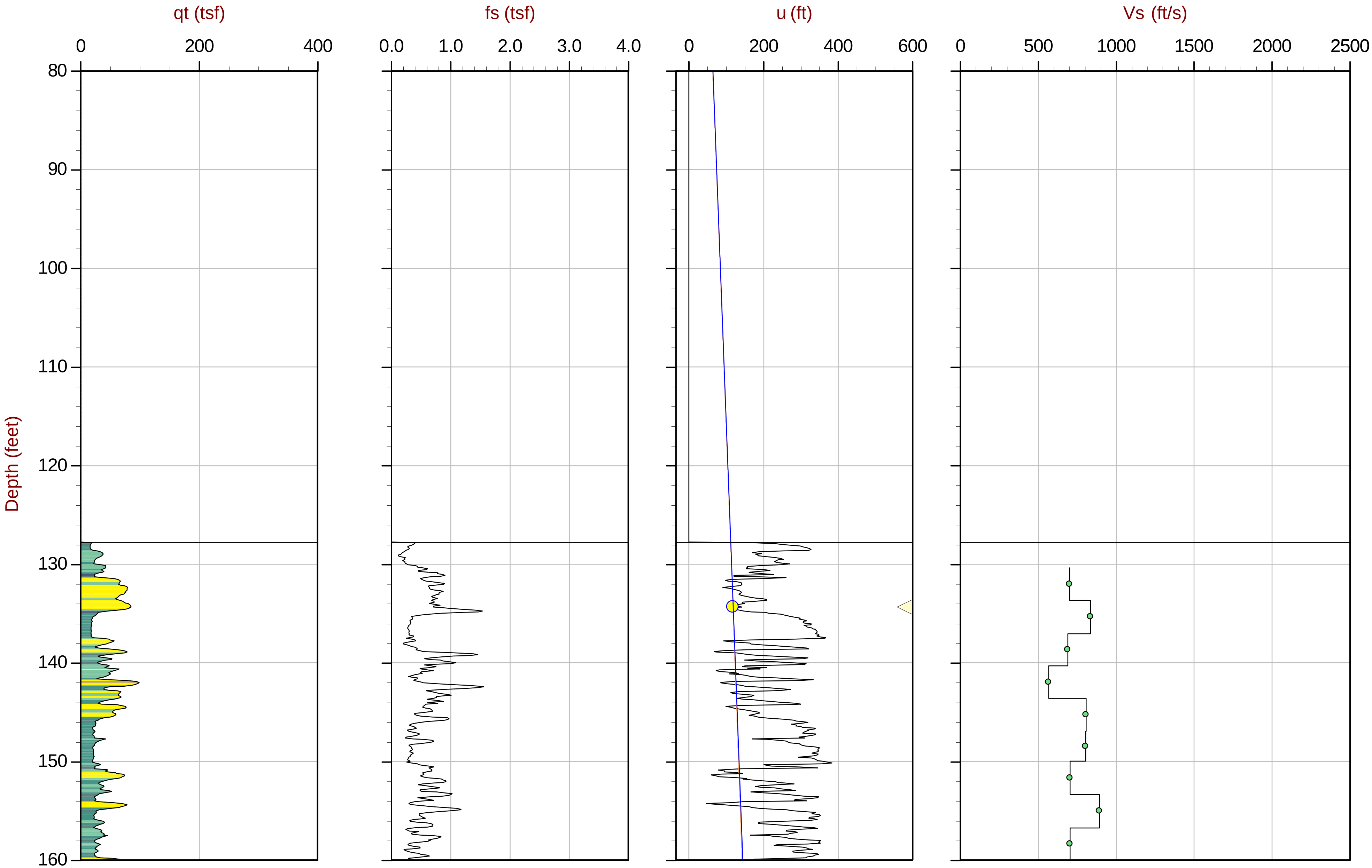
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 2 of 3

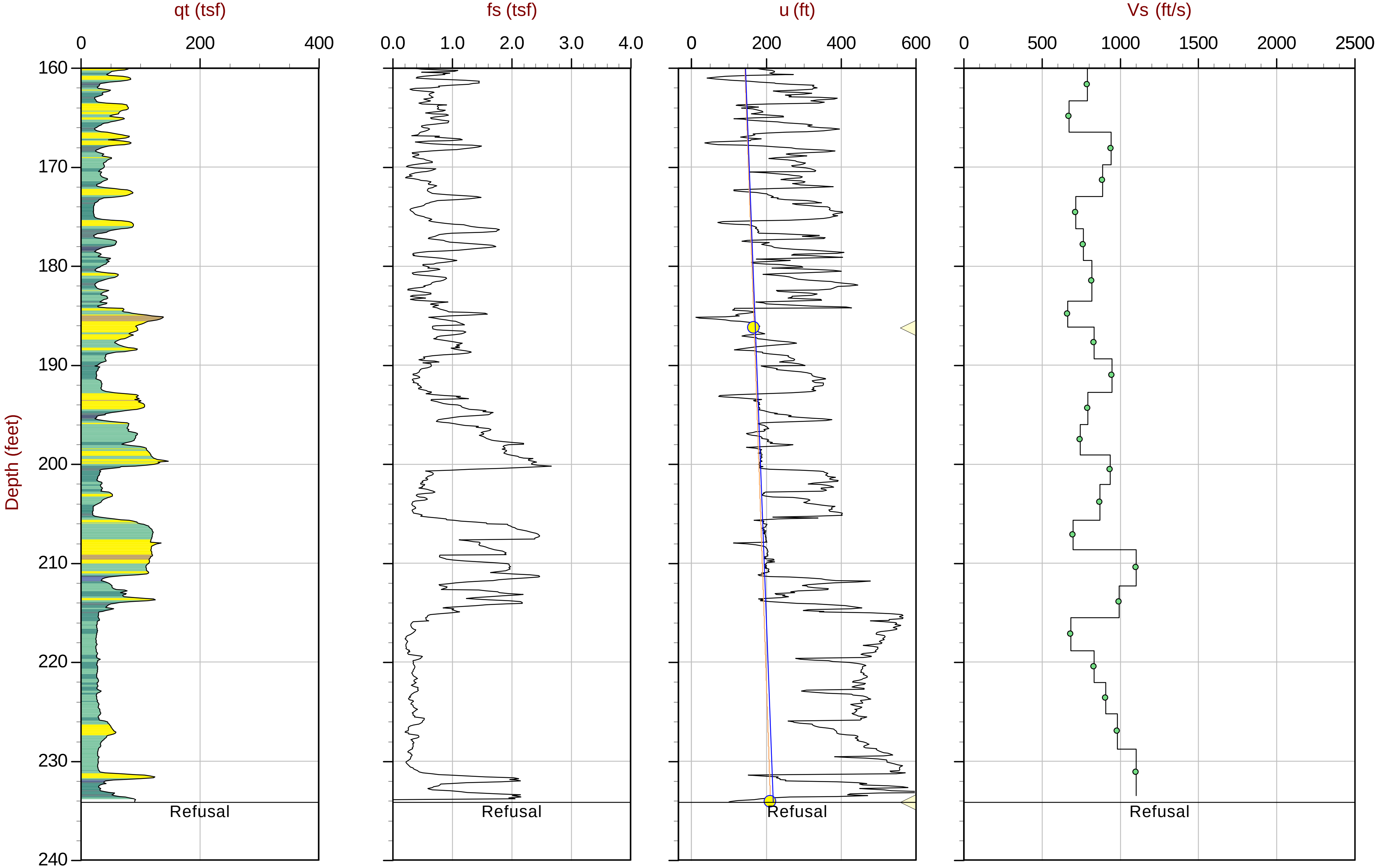
Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03:10:17 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K



Max Depth: 71.375 m / 234.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 17-51001_SP32.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 6 N: 7208062m E: 485197m
Page No: 3 of 3

Overplot Item: Assumed Ueq; Ueq; Dissipation, equilibrium achieved; Dissipation, equilibrium not achieved; Equilibrium profile; Hydrostatic Line

Cone Penetration Test Seismic Tabular Results

Job No: 17-51001
Client: Fairbanks Gold Mining
Project: Fort Knox TSF
Sounding ID: SCPT17-23
Date: 07-Mar-2017

Seismic Source: Beam
Source Offset (ft): 2.62
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
22.70	22.05	22.20			
26.15	25.49	25.63	3.42	7.41	462
29.43	28.77	28.89	3.27	10.37	315
32.64	31.99	32.10	3.20	12.55	255
35.86	35.20	35.30	3.21	8.99	357
42.55	41.90	41.98	6.68	9.49	703
45.83	45.18	45.25	3.27	8.28	395
49.11	48.46	48.53	3.28	6.68	491
52.26	51.61	51.67	3.15	2.63	1196
55.54	54.89	54.95	3.28	1.98	1656
58.83	58.17	58.23	3.28	2.36	1390
62.01	61.35	61.41	3.18	2.03	1567
65.45	64.80	64.85	3.44	1.96	1757
68.73	68.08	68.13	3.28	1.85	1769
72.01	71.36	71.41	3.28	3.97	825
75.30	74.64	74.69	3.28	7.26	451
78.51	77.85	77.90	3.21	6.82	471
81.86	81.20	81.24	3.34	2.91	1150
85.14	84.48	84.52	3.28	2.40	1364
91.80	91.14	91.18	6.66	4.09	1627
94.98	94.32	94.36	3.18	3.21	992
114.67	114.01	114.04	19.68	17.42	1130

Job No: 17-51001
Client: Fairbanks Gold Mining
Project: Fort Knox TSF
Sounding ID: SCPT17-24
Date: 03-Mar-2017

Seismic Source: Beam
Source Offset (ft): 2.78
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
12.80	12.14	12.45			
16.08	15.42	15.67	3.22	6.72	479
19.36	18.70	18.91	3.24	8.13	398
22.57	21.92	22.09	3.19	4.06	784
25.85	25.20	25.35	3.26	9.06	359
35.76	35.10	35.21	9.86	26.64	370
39.04	38.39	38.49	3.27	13.20	248
42.32	41.67	41.76	3.27	8.21	399
45.60	44.95	45.03	3.27	3.96	826
48.88	48.23	48.31	3.28	2.05	1599
52.17	51.51	51.58	3.28	1.72	1906
55.45	54.79	54.86	3.28	1.88	1747
58.73	58.07	58.14	3.28	2.19	1498
62.01	61.35	61.41	3.28	2.23	1473
65.29	64.63	64.69	3.28	2.93	1118
68.57	67.91	67.97	3.28	2.64	1241

Job No:	17-51001
Client:	Fairbanks Gold Mining
Project:	Fort Knox TSF
Sounding ID:	SCPT17-25
Date:	02-Mar-2017

Seismic Source:	Beam
Source Offset (ft):	2.79
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
15.75	15.09	15.35			
19.03	18.37	18.58	3.24	7.19	450
28.87	28.22	28.35	9.77	22.39	436
35.43	34.78	34.89	6.54	15.48	422
38.71	38.06	38.16	3.27	9.27	353
41.99	41.34	41.43	3.27	10.11	324
45.28	44.62	44.71	3.27	6.42	510
48.49	47.83	47.92	3.21	3.69	870
52.00	51.35	51.42	3.51	2.05	1711
68.24	67.58	67.64	16.22	46.18	351
74.80	74.15	74.20	6.56	10.25	640
78.08	77.43	77.48	3.28	4.13	794
81.43	80.77	80.82	3.34	2.93	1143
84.71	84.05	84.10	3.28	3.10	1058
87.99	87.34	87.38	3.28	3.45	949
91.27	90.62	90.66	3.28	4.00	820
94.55	93.90	93.94	3.28	2.53	1296
97.83	97.18	97.22	3.28	2.07	1588
101.05	100.39	100.43	3.21	6.35	506
104.33	103.67	103.71	3.28	4.15	790
108.10	107.45	107.48	3.77	2.70	1399

Job No:	17-51001
Client:	Fairbanks Gold Mining Inc.
Project:	Fort Knox TSF
Sounding ID:	SCPT17-26
Date:	08-Mar-2017

Seismic Source:	Beam
Source Offset (ft):	2.62
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
19.52	18.86	19.05			
22.80	22.15	22.30	3.25	7.80	417
25.98	25.33	25.46	3.16	6.15	515
29.36	28.71	28.83	3.36	3.85	873
32.64	31.99	32.10	3.27	6.30	519
36.09	35.43	35.53	3.43	6.50	529
39.47	38.81	38.90	3.37	3.53	953
42.49	41.83	41.91	3.01	4.97	606
45.77	45.11	45.19	3.27	6.30	520
49.05	48.39	48.46	3.28	5.15	636
52.26	51.61	51.67	3.21	2.62	1227
55.54	54.89	54.95	3.28	2.56	1279
58.73	58.07	58.13	3.18	3.00	1060
62.11	61.45	61.51	3.38	3.20	1055
65.55	64.89	64.95	3.44	1.75	1962
68.83	68.18	68.23	3.28	2.67	1230
72.11	71.46	71.50	3.28	5.63	582
75.39	74.74	74.78	3.28	4.07	805
78.67	78.02	78.06	3.28	2.96	1108
81.96	81.30	81.34	3.28	2.01	1630
85.24	84.58	84.62	3.28	1.63	2018
91.80	91.14	91.18	6.56	6.20	1058
95.08	94.42	94.46	3.28	2.69	1220
98.43	97.77	97.80	3.35	3.12	1072
101.48	100.82	100.85	3.05	2.12	1440
104.76	104.10	104.13	3.28	2.20	1491
108.10	107.45	107.48	3.35	1.73	1934
111.29	110.63	110.66	3.18	1.97	1618
114.57	113.91	113.94	3.28	3.64	902
117.72	117.06	117.09	3.15	2.53	1247
121.13	120.47	120.50	3.41	3.99	854
124.41	123.75	123.78	3.28	4.71	696
127.69	127.03	127.06	3.28	5.07	647
130.91	130.25	130.28	3.21	3.50	918
134.19	133.53	133.56	3.28	3.75	875
140.81	140.16	140.18	6.63	5.70	1162
144.03	143.37	143.40	3.22	2.61	1233
147.38	146.72	146.74	3.35	3.42	978
153.87	153.22	153.24	6.50	7.25	896
157.15	156.50	156.52	3.28	3.50	936

	Job No:	17-51001
	Client:	Fairbanks Gold Mining Inc.
	Project:	Fort Knox TSF
	Sounding ID:	SCPT17-26
	Date:	08-Mar-2017

Seismic Source:	Beam
Source Offset (ft):	2.62
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
160.50	159.84	159.86	3.35	3.42	978
163.78	163.12	163.14	3.28	2.12	1548
170.44	169.78	169.80	6.66	4.40	1514
176.84	176.18	176.20	6.40	4.81	1331
182.74	182.09	182.11	5.90	4.07	1449

Job No: 17-51001
Client: Fairbanks Gold Mining
Project: Fort Knox TSF
Sounding ID: SCPT17-27
Date: 07-Mar-2017

Seismic Source: Beam
Source Offset (ft): 2.62
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
22.57	21.92	22.07			
25.85	25.20	25.33	3.26	7.80	418
29.13	28.48	28.60	3.27	9.34	350
32.32	31.66	31.77	3.17	11.31	280
35.60	34.94	35.04	3.27	19.44	168
38.88	38.22	38.31	3.27	10.67	307
42.06	41.40	41.49	3.18	9.92	320
45.44	44.78	44.86	3.37	8.90	379
48.72	48.06	48.14	3.28	1.60	2044
51.90	51.25	51.31	3.18	1.50	2120
55.12	54.46	54.52	3.21	1.43	2251
61.75	61.09	61.15	6.62	4.11	1609
65.03	64.37	64.42	3.28	2.46	1332
68.41	67.75	67.80	3.38	3.54	954
71.69	71.03	71.08	3.28	8.12	404
74.87	74.21	74.26	3.18	9.61	331
78.15	77.49	77.54	3.28	5.73	573
81.36	80.71	80.75	3.21	3.45	932
87.86	87.20	87.24	6.49	4.23	1535
91.27	90.62	90.65	3.41	2.35	1450
97.93	97.28	97.31	6.66	8.52	781

CONETEC

Job No: 17-51001
Client: Fairbanks Gold Mining Inc.
Project: Fort Knox TSF
Sounding ID: SCPT17-28
Date: 06-Mar-2017

Seismic Source: Beam
Source Offset (ft): 2.79
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
16.08	15.42	15.67			
22.57	21.92	22.09	6.42	17.16	374
32.58	31.92	32.04	9.95	26.13	381
39.14	38.48	38.59	6.54	18.45	354
42.42	41.77	41.86	3.27	11.48	285
45.70	45.05	45.13	3.27	7.65	428
48.98	48.33	48.41	3.27	2.25	1455
52.26	51.61	51.68	3.28	1.80	1819
55.38	54.72	54.80	3.11	1.80	1729
58.66	58.00	58.07	3.28	7.65	428
65.22	64.57	64.63	6.55	12.15	539
68.41	67.75	67.81	3.18	6.98	456
71.85	71.19	71.25	3.44	10.80	319
75.07	74.41	74.46	3.21	9.45	340
78.35	77.69	77.74	3.28	7.65	428
81.69	81.04	81.08	3.34	6.98	479
84.97	84.32	84.36	3.28	4.52	726
91.63	90.98	91.02	6.66	6.94	959
101.38	100.72	100.76	9.74	10.82	900
111.22	110.56	110.60	9.84	11.70	841

Job No: 17-51001
Client: Fairbanks Gold Mining Inc.
Project: Fort Knox TSF
Sounding ID: SCPT17-29
Date: 04-Mar-2017

Seismic Source: Beam
Source Offset (ft): 2.62
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
21.98	21.33	21.49			
29.20	28.54	28.66	7.18	24.70	291
32.48	31.82	31.93	3.27	13.78	237
35.70	35.04	35.14	3.21	11.69	274
39.14	38.48	38.57	3.44	8.32	413
42.32	41.67	41.75	3.18	10.76	295
45.60	44.95	45.02	3.27	6.56	499
48.82	48.16	48.23	3.21	2.58	1246
52.10	51.44	51.51	3.28	1.83	1790
55.45	54.79	54.85	3.34	1.60	2094
58.73	58.07	58.13	3.28	9.36	350
61.94	61.29	61.34	3.21	9.84	326
65.29	64.63	64.69	3.34	5.40	619
68.57	67.91	67.96	3.28	8.06	407
71.85	71.19	71.24	3.28	8.82	372
75.07	74.41	74.46	3.21	8.73	368
78.51	77.85	77.90	3.44	6.34	543
81.96	81.30	81.34	3.44	7.10	485
84.81	84.15	84.19	2.85	5.55	514
87.99	87.34	87.38	3.18	5.21	611
91.37	90.72	90.75	3.38	2.26	1495
94.82	94.16	94.20	3.44	2.98	1157
98.03	97.37	97.41	3.21	2.84	1131
101.38	100.72	100.76	3.35	2.34	1432
104.66	104.00	104.04	3.28	3.11	1055
107.94	107.28	107.32	3.28	5.56	590
111.22	110.56	110.60	3.28	2.30	1424
114.44	113.78	113.81	3.21	2.41	1335
124.28	123.62	123.65	9.84	15.29	644
134.25	133.60	133.62	9.97	12.37	806
144.03	143.37	143.40	9.78	12.62	775
153.81	153.15	153.17	9.78	9.95	983

Job No: 17-51001
Client: Fairbanks Gold Mining Inc.
Project: Fort Knox TSF
Sounding ID: SCPT16-30
Date: 28-Feb-2017

Seismic Source: Beam
Source Offset (ft): 2.79
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
19.03	18.37	18.58			
22.31	21.65	21.83	3.25	6.01	540
25.59	24.93	25.09	3.26	7.35	443
28.94	28.28	28.42	3.33	9.13	365
32.22	31.56	31.68	3.27	9.13	358
35.50	34.84	34.95	3.27	9.66	339
38.78	38.12	38.22	3.27	10.16	322
42.06	41.40	41.50	3.27	7.12	460
58.46	57.81	57.87	16.38	47.62	344
61.74	61.09	61.15	3.28	6.46	507
65.03	64.37	64.43	3.28	7.64	429
68.31	67.65	67.71	3.28	8.03	408
71.59	70.93	70.99	3.28	7.59	432
74.87	74.21	74.26	3.28	7.23	453
78.15	77.49	77.54	3.28	5.99	547
81.53	80.87	80.92	3.38	6.91	488
84.71	84.05	84.10	3.18	4.38	727
87.99	87.33	87.38	3.28	2.09	1569
91.37	90.71	90.76	3.38	2.17	1556
93.93	93.27	93.31	2.56	1.60	1596

Job No: 17-51001
Client: Fairbanks Gold Mining Inc.
Project: Fort Knox TSF
Sounding ID: SCPT17-32
Date: 10-Mar-2017

Seismic Source: Beam
Source Offset (ft): 2.62
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
131.07	130.41	130.44			
134.35	133.69	133.72	3.28	4.68	701
137.73	137.07	137.10	3.38	4.04	837
141.01	140.35	140.38	3.28	4.75	690
144.29	143.63	143.66	3.28	5.76	569
147.64	146.98	147.01	3.35	4.14	807
150.66	150.00	150.02	3.02	3.75	804
154.04	153.38	153.40	3.38	4.80	704
157.41	156.76	156.78	3.38	3.78	894
160.70	160.04	160.06	3.28	4.65	705
163.98	163.32	163.34	3.28	4.14	791
167.16	166.50	166.52	3.18	4.71	676
170.44	169.78	169.80	3.28	3.48	943
173.62	172.97	172.99	3.18	3.59	887
176.90	176.25	176.27	3.28	4.58	716
180.12	179.46	179.48	3.22	4.20	765
184.22	183.56	183.58	4.10	5.00	819
186.84	186.19	186.21	2.62	3.94	666
190.03	189.37	189.39	3.18	3.82	834
193.41	192.75	192.77	3.38	3.57	947
196.69	196.03	196.05	3.28	4.13	794
199.74	199.08	199.10	3.05	4.09	745
202.76	202.10	202.12	3.02	3.22	936
206.36	205.71	205.73	3.61	4.14	871
209.32	208.66	208.68	2.95	4.22	700
212.99	212.34	212.35	3.67	3.33	1104
216.21	215.55	215.57	3.22	3.24	993
219.55	218.90	218.91	3.35	4.89	684
222.77	222.11	222.13	3.22	3.85	834
225.89	225.23	225.24	3.12	3.43	909
229.49	228.84	228.85	3.61	3.67	983
234.19	233.53	233.54	4.69	4.25	1104

Pore Pressure Dissipation Summary and
Pore Pressure Dissipation Plots

ConeTec

	Job No:	17-51001
	Client:	Fairbanks Gold Mining Inc.
	Project:	Fort Knox TSF
	Start Date:	28-Feb-2017
	End Date:	10-Mar-2017

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)
SCPT17-23	17-51001_SP23	15	400	26.164	Not Achieved	
SCPT17-23	17-51001_SP23	15	800	49.130	54.0	-4.8
SCPT17-23	17-51001_SP23	15	800	68.733	95.8	-27.1
SCPT17-23	17-51001_SP23	15	550	91.124	139.3	-48.2
SCPT17-23	17-51001_SP23	15	500	101.377	170.3	-68.9
SCPT17-23	17-51001_SP23	15	395	117.207	150.6	-33.4
SCPT17-23	17-51001_SP23	15	1220	129.674	151.5	-21.8
SCPT17-23	17-51001_SP23	15	1250	166.008	187.9	-21.9
SCPT17-23	17-51001_SP23	15	800	193.239	Not Achieved	
SCPT17-23	17-51001_SP23	15	800	221.454	272.8	-51.3
SCPT17-23	17-51001_SP23	15	800	250.161	245.2	5.0
SCPT17-24	17-51001_SP24	15	340	21.817	22.5	-0.7
SCPT17-24	17-51001_SP24	15	360	31.906	38.7	-6.8
SCPT17-24	17-51001_SP24	15	295	45.275	53.6	-8.3
SCPT17-24	17-51001_SP24	15	720	62.007	93.1	-31.1
SCPT17-24	17-51001_SP24	15	485	77.919	Not Achived	
SCPT17-24	17-51001_SP24	15	420	104.576	Not Achived	
SCPT17-24	17-51001_SP24	15	300	124.096	173.0	-48.9
SCPT17-24	17-51001_SP24	15	180	130.248	178.2	-48.0
SCPT17-24	17-51001_SP24	15	450	142.715	Not Achived	
SCPT17-24	17-51001_SP24	15	960	170.192	Not Achived	
SCPT17-25	17-51001_SP25	15	230	19.029	21.5	-2.5
SCPT17-25	17-51001_SP25	15	740	19.193	21.5	-2.3
SCPT17-25	17-51001_SP25	15	760	29.691	Not Achieved	
SCPT17-25	17-51001_SP25	15	330	44.537	54.4	-9.9
SCPT17-25	17-51001_SP25	15	190	52.821	Not Achieved	
SCPT17-25	17-51001_SP25	15	2800	72.998	Not Achieved	
SCPT17-25	17-51001_SP25	15	1000	108.102	151.5	-43.4
SCPT17-25	17-51001_SP25	15	400	138.122	Not Achieved	
SCPT17-26	17-51001_SP26	15	300	23.868	11.5	12.4
SCPT17-26	17-51001_SP26	15	500	46.751	25.0	21.7
SCPT17-26	17-51001_SP26	15	1900	66.682	59.2	7.5
SCPT17-26	17-51001_SP26	15	900	99.326	Not Achieved	
SCPT17-26	17-51001_SP26	15	300	121.964	110.5	11.5
SCPT17-26	17-51001_SP26	15	1250	145.668	128.9	16.8

	Job No:	17-51001
	Client:	Fairbanks Gold Mining Inc.
	Project:	Fort Knox TSF
	Start Date:	28-Feb-2017
	End Date:	10-Mar-2017

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)
SCPT17-26	17-51001_SP26	15	900	182.741	Not Achieved	
SCPT17-27	17-51001_SP27	15	1400	58.398	81.6	-23.2
SCPT17-27	17-51001_SP27	15	8960	86.859	133.1	-46.2
SCPT17-27	17-51001_SP27	15	300	94.241	141.2	-47.0
SCPT17-27	17-51001_SP27	15	300	106.626	158.2	-51.5
SCPT17-27	17-51001_SP27	15	300	123.030	202.9	-79.9
SCPT17-27	17-51001_SP27	15	325	133.611	178.2	-44.6
SCPT17-27	17-51001_SP27	15	1200	147.144	Not Achieved	
SCPT17-28	17-51001_SP28	15	600	19.275	17.4	1.9
SCPT17-28	17-51001_SP28	15	500	35.843	42.3	-6.5
SCPT17-28	17-51001_SP28	15	3750	52.247	Not Achived	
SCPT17-28	17-51001_SP28	15	350	65.206	81.4	-16.2
SCPT17-28	17-51001_SP28	15	250	68.405	84.5	-16.1
SCPT17-28	17-51001_SP28	15	1200	114.336	170.1	-55.7
SCPT17-28	17-51001_SP28	15	600	139.762	187.0	-47.3
SCPT17-28	17-51001_SP28	15	2295	171.914	Not Achived	
SCPT17-28	17-51001_SP28	15	600	191.025	Not Achieved	
SCPT17-28	17-51001_SP28	15	180	208.413	252.3	-43.9
SCPT17-28	17-51001_SP28	15	445	219.404	263.4	-44.0
SCPT17-28	17-51001_SP28	15	250	226.867	270.7	-43.8
SCPT17-28	17-51001_SP28	15	900	250.653	283.5	-32.8
SCPT17-29	17-51001_SP29	15	800	58.726	74.9	-16.2
SCPT17-29	17-51001_SP29	15	400	80.134	98.7	-18.6
SCPT17-29	17-51001_SP29	15	800	119.011	174.1	-55.0
SCPT17-29	17-51001_SP29	15	160	134.267	Not Achived	
SCPT17-29	17-51001_SP29	15	500	161.005	Not Achived	
SCPT16-30	17-51001_SP30	15	600	32.234	Not Achieved	
SCPT16-30	17-51001_SP30	15	2100	42.650	Not Achieved	
SCPT16-30	17-51001_SP30	15	1300	44.291	Not Achieved	
SCPT16-30	17-51001_SP30	15	1310	83.250	350.0	-23.4
SCPT16-30	17-51001_SP30	15	800	93.913	422.8	-35.0
SCPT16-30	17-51001_SP30	15	350	163.548	561.4	-7.6
SCPT16-30	17-51001_SP30	15	2200	187.088	Not Achieved	
SCPT17-32	17-51001_SP32	15	350	134.349	118.8	15.5
SCPT17-32	17-51001_SP32	15	300	186.267	168.2	18.1

Job No: 17-51001
Client: Fairbanks Gold Mining Inc.
Project: Fort Knox TSF
Start Date: 28-Feb-2017
End Date: 10-Mar-2017

CPTu PORE PRESSURE DISSIPATION SUMMARY

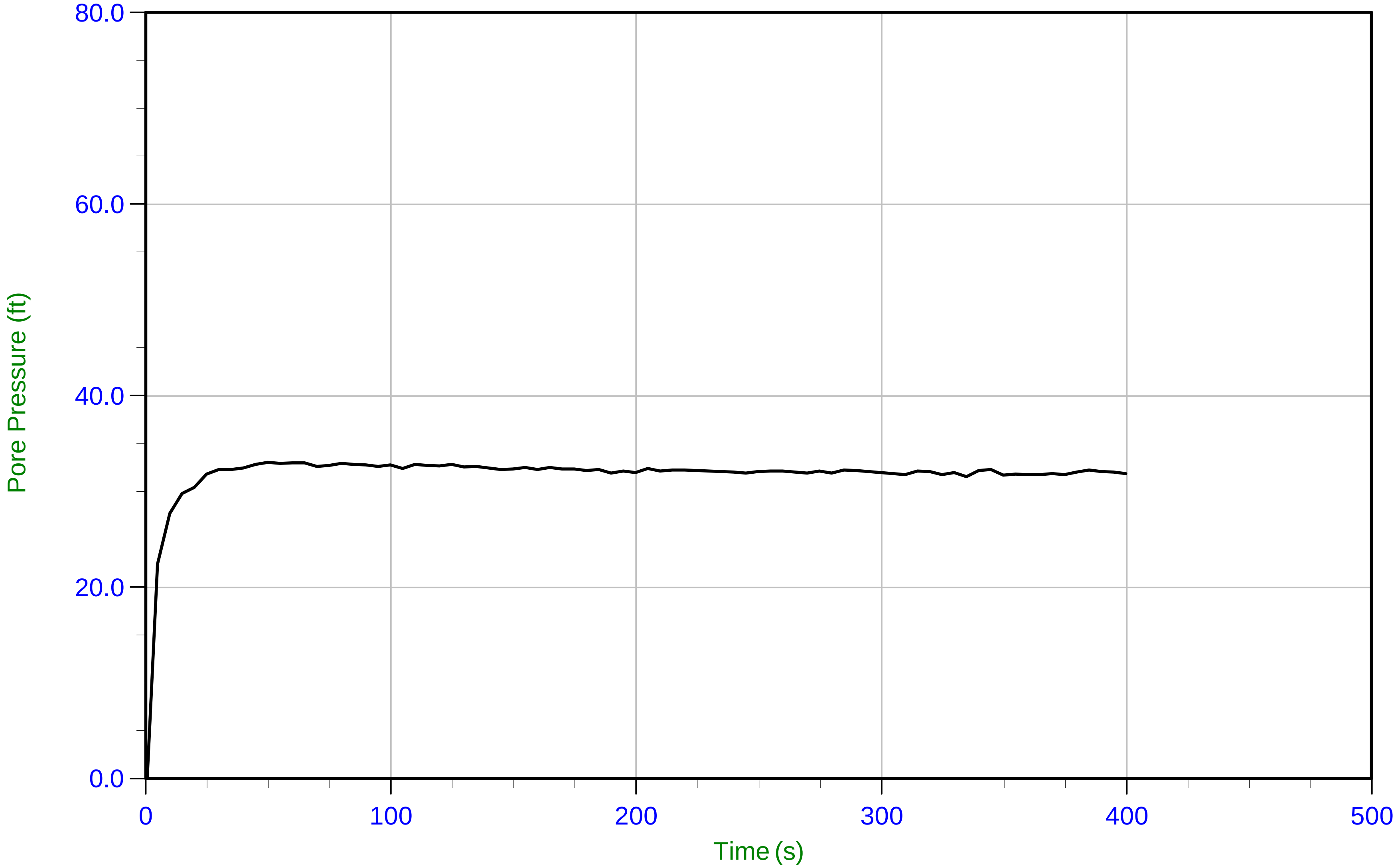
Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)
SCPT17-32	17-51001_SP32	15	650	234.167	211.7	22.5

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP23.PPF
Depth: 7.975 m / 26.164 ft
Duration: 400.0 s

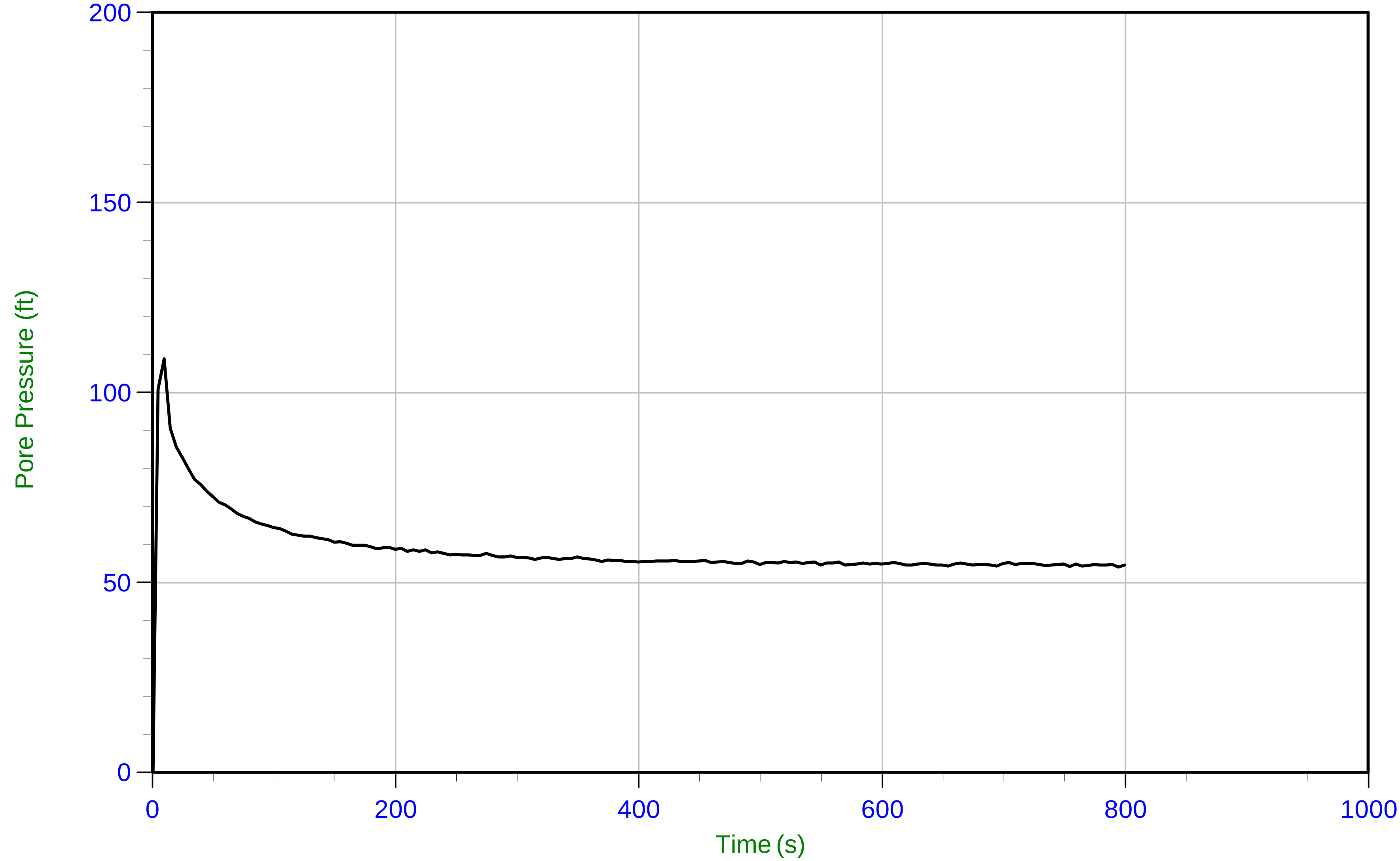
U Min: -3.9 ft
U Max: 33.0 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K Area=15 cm²



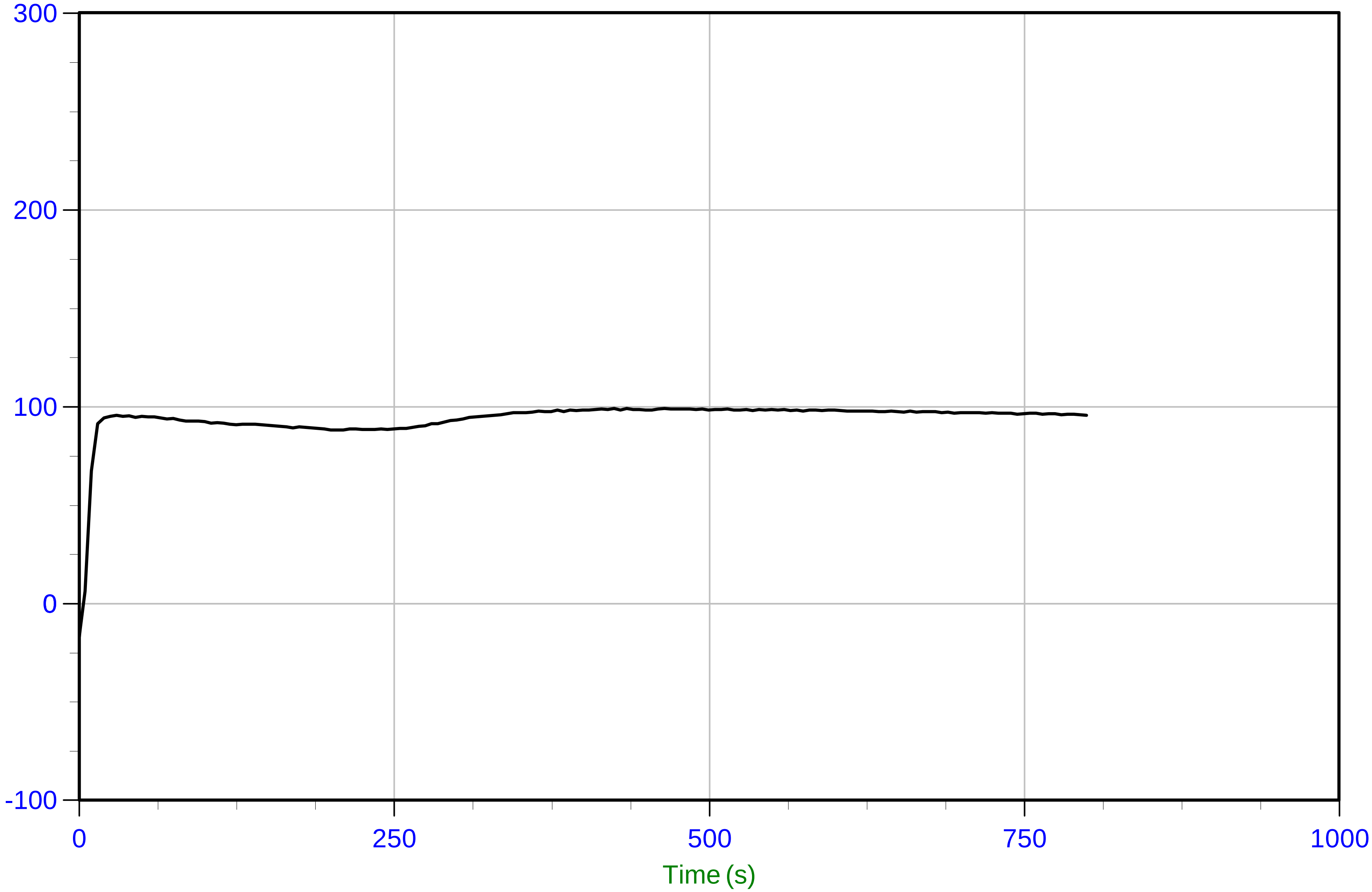
Trace Summary:

Filename: 17-51001_SP23.PPF
Depth: 14.975 m / 49.130 ft
Duration: 800.0 s

U Min: -12.3 ft
U Max: 108.9 ft

WT: -1.477 m / -4.846 ft
Ueq: 54.0 ft

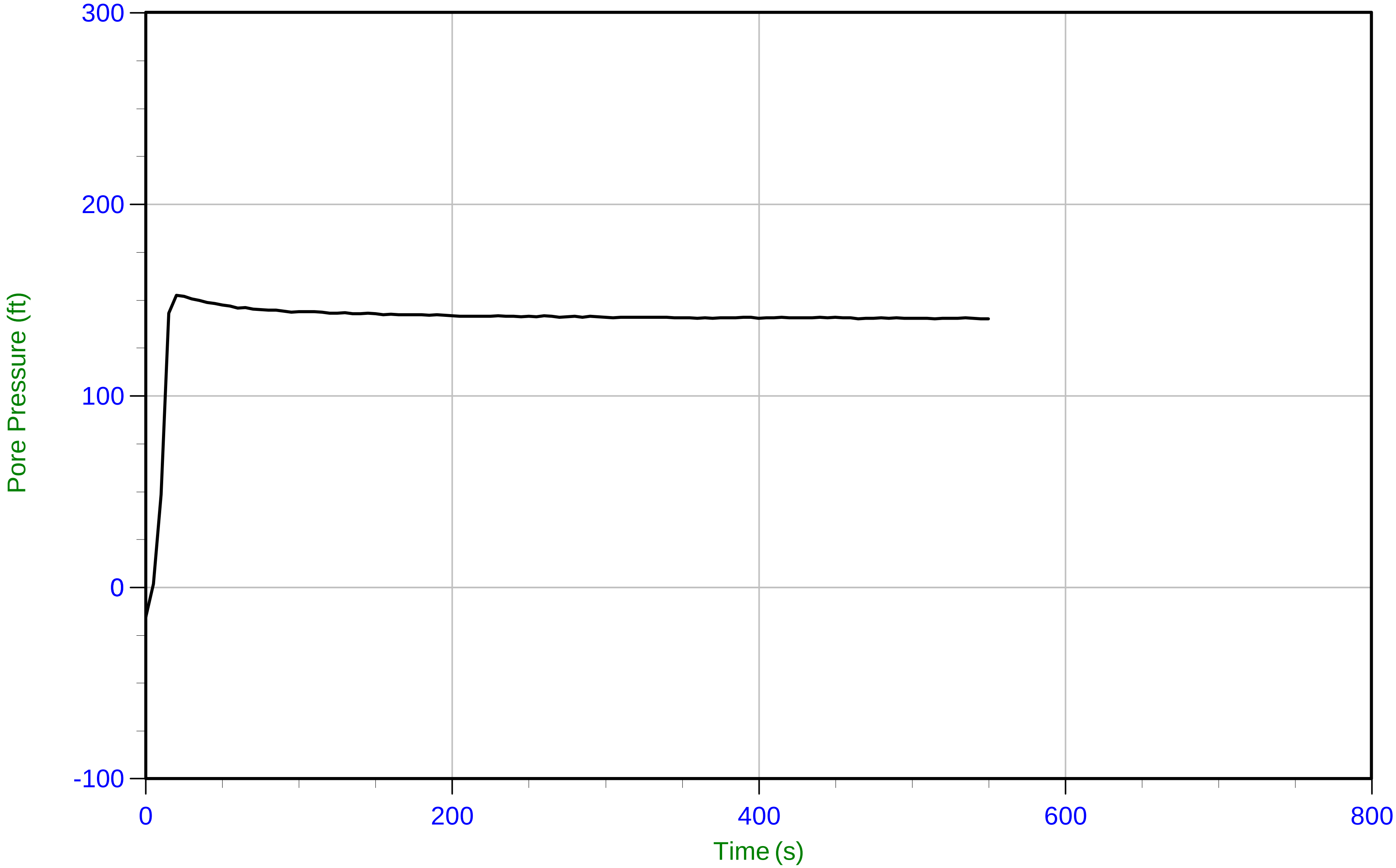
Fairbanks Gold Mining	Job No: 17-51001 Date: 03/07/2017 20:26 Site: Fort Knox TSF	Sounding: SCPT17-23 Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP23.PPF	U Min: -17.1 ft	WT: -8.255 m / -27.083 ft
Depth: 20.950 m / 68.733 ft	U Max: 99.1 ft	Ueq: 95.8 ft
Duration: 800.0 s		

Fairbanks Gold Mining	Job No: 17-51001 Date: 03/07/2017 20:26 Site: Fort Knox TSF	Sounding: SCPT17-23 Cone: 473:T1500F15U1K Area=15 cm²



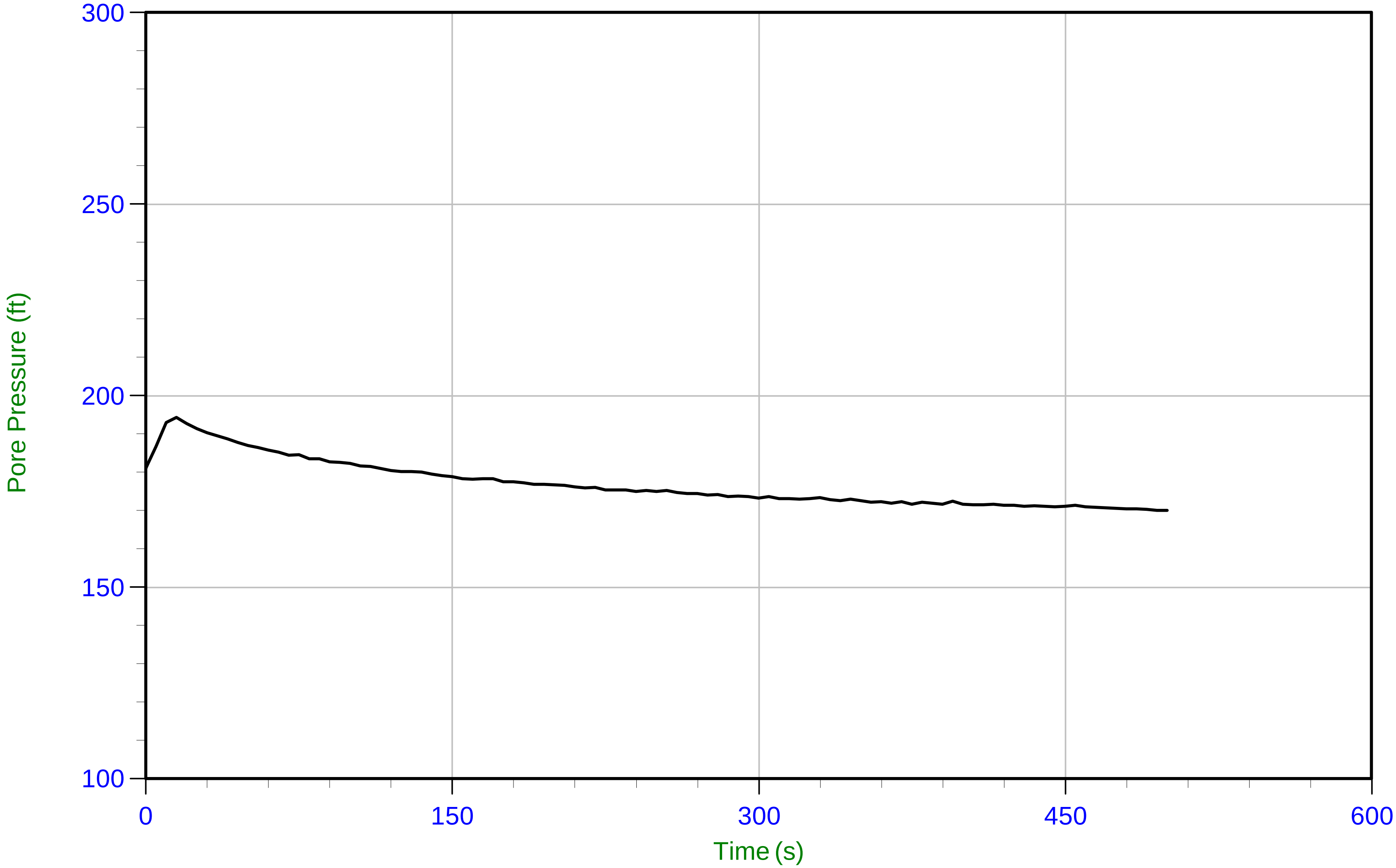
Trace Summary:

Filename: 17-51001_SP23.PPF	U Min: -15.5 ft	WT: -14.693 m / -48.205 ft
Depth: 27.775 m / 91.124 ft	U Max: 152.5 ft	Ueq: 139.3 ft
Duration: 550.0 s		

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K Area=15 cm²



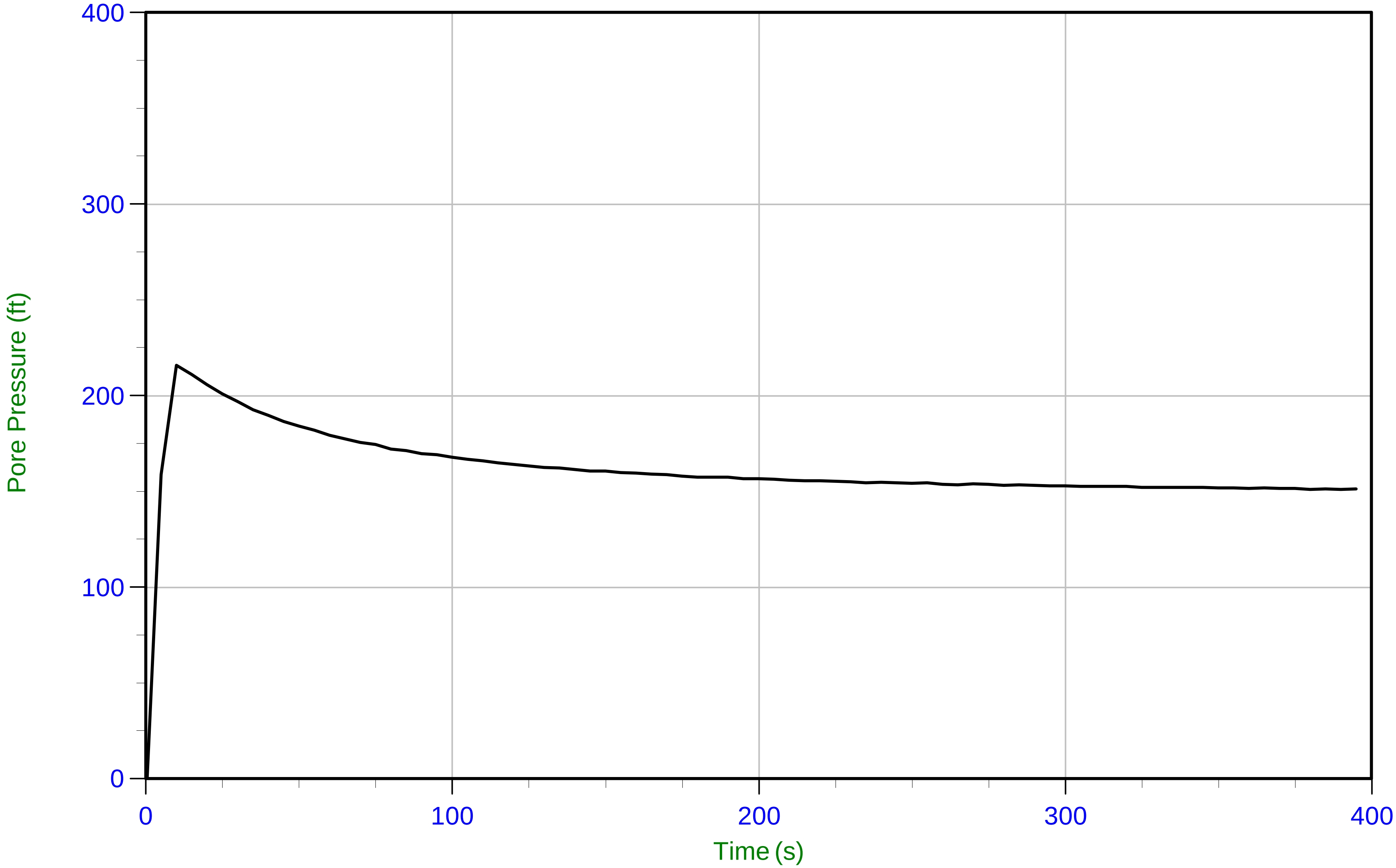
Trace Summary:

Filename: 17-51001_SP23.PPF
Depth: 30.900 m / 101.377 ft
Duration: 500.0 s

U Min: 170.1 ft
U Max: 194.3 ft

WT: -21.005 m / -68.913 ft
Ueq: 170.3 ft

Fairbanks Gold Mining	Job No: 17-51001	Sounding: SCPT17-23
	Date: 03/07/2017 20:26	Cone: 473:T1500F15U1K Area=15 cm²
	Site: Fort Knox TSF	



Trace Summary:

Filename: 17-51001_SP23.PPF
Depth: 35.725 m / 117.207 ft
Duration: 395.0 s

U Min: -15.4 ft
U Max: 215.8 ft

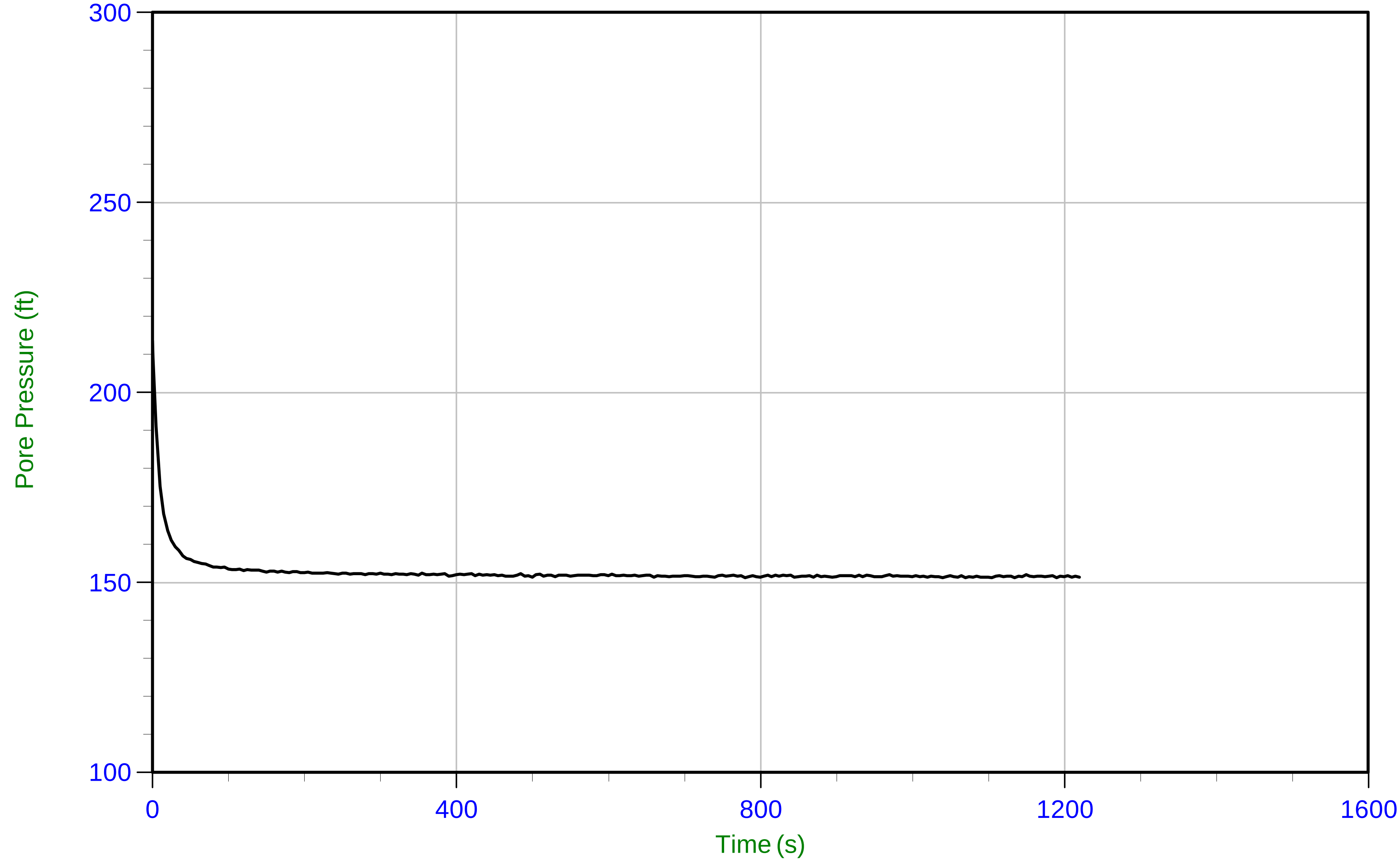
WT: -10.186 m / -33.418 ft
Ueq: 150.6 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP23.PPF
Depth: 39.525 m / 129.674 ft
Duration: 1220.0 s

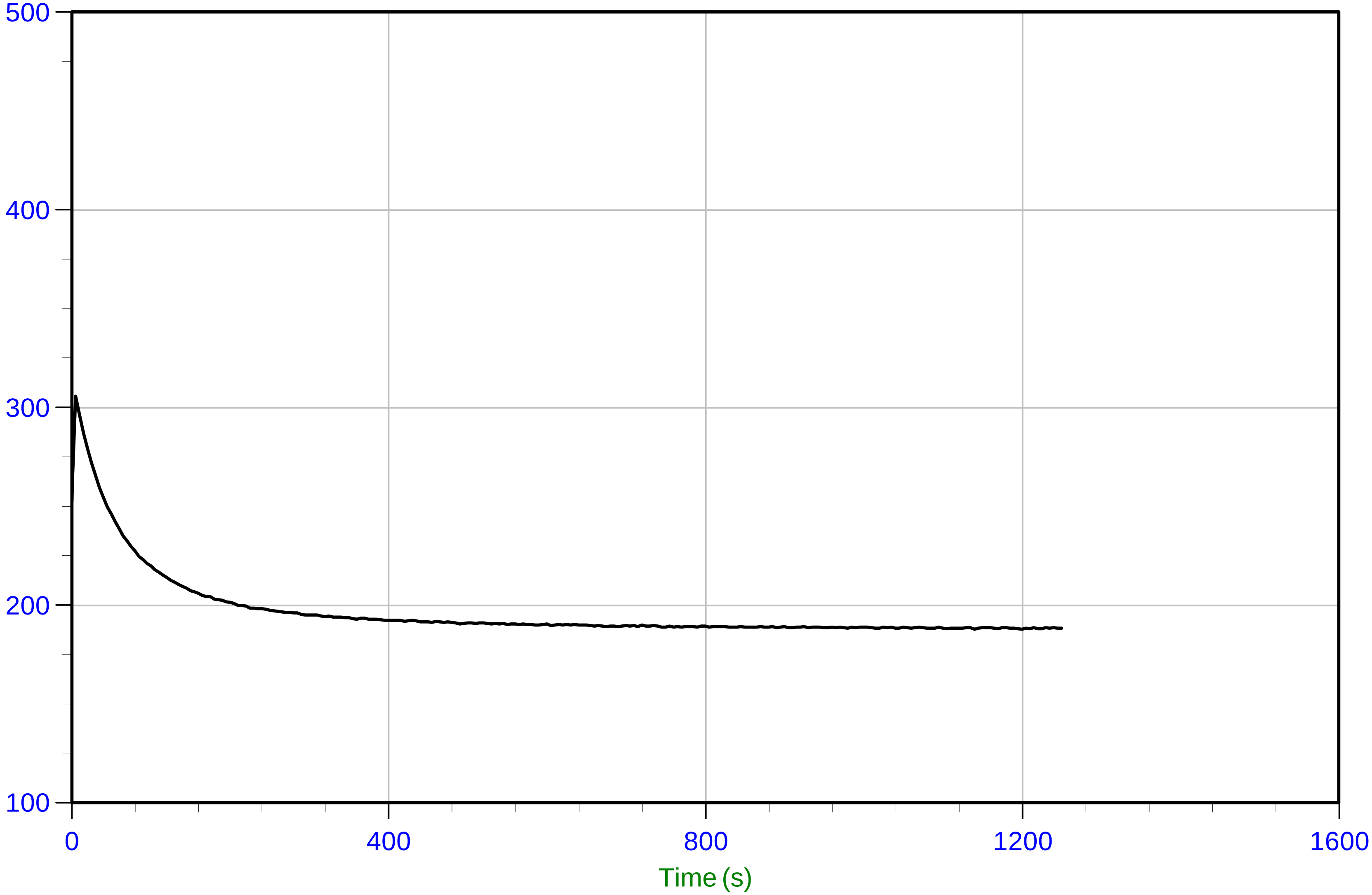
U Min: 151.3 ft
U Max: 213.7 ft

WT: -6.641 m / -21.788 ft
Ueq: 151.5 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

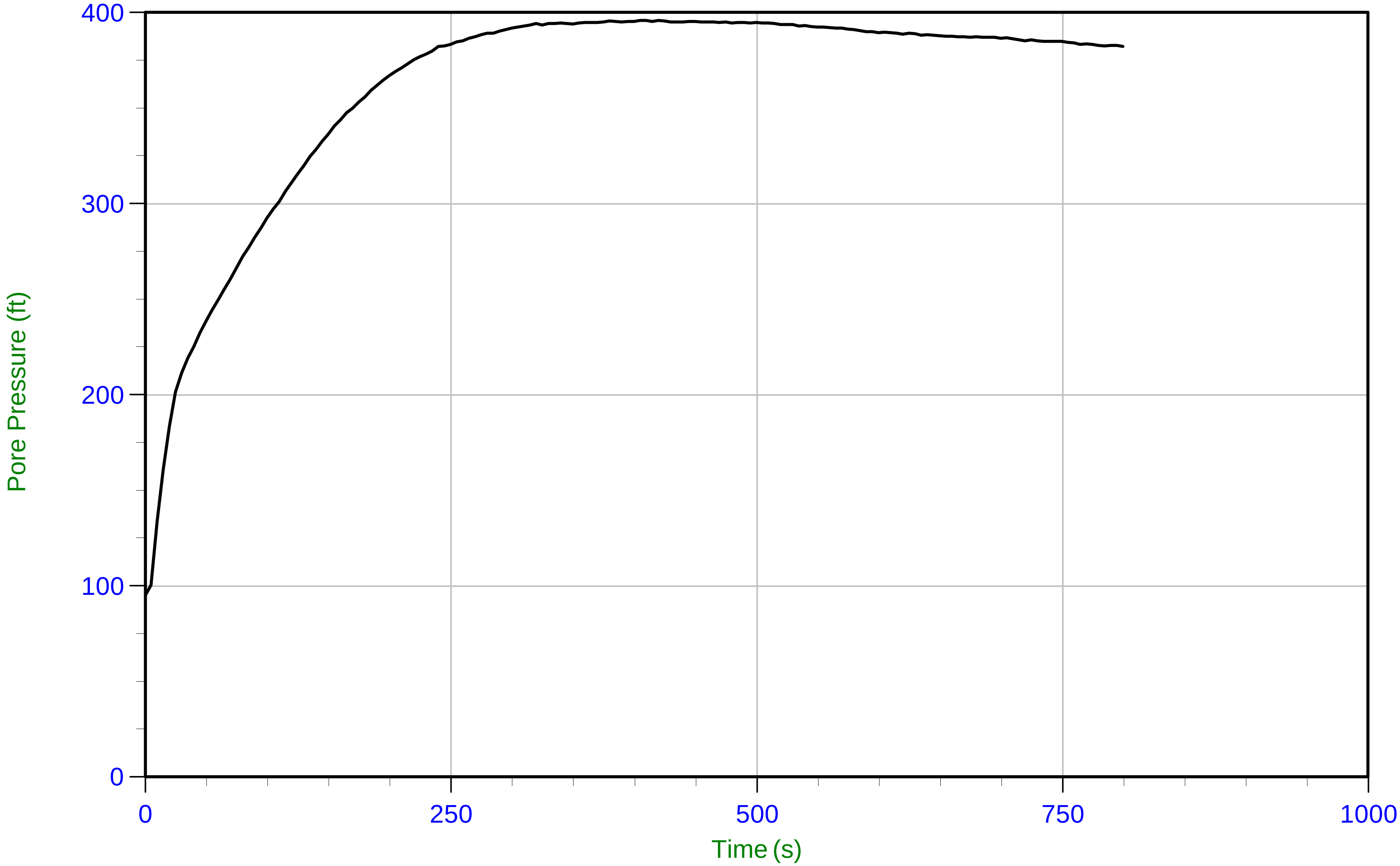
Filename: 17-51001_SP23.PPF
Depth: 50.600 m / 166.008 ft
Duration: 1250.0 s

U Min: 187.8 ft
U Max: 305.8 ft

WT: -6.662 m / -21.857 ft
Ueq: 187.9 ft

Job No: 17-51001	Sounding: SCPT17-23
Date: 03/07/2017 20:26	Cone: 473:T1500F15U1K Area=15 cm²
Site: Fort Knox TSF	

Fairbanks Gold Mining



Trace Summary:

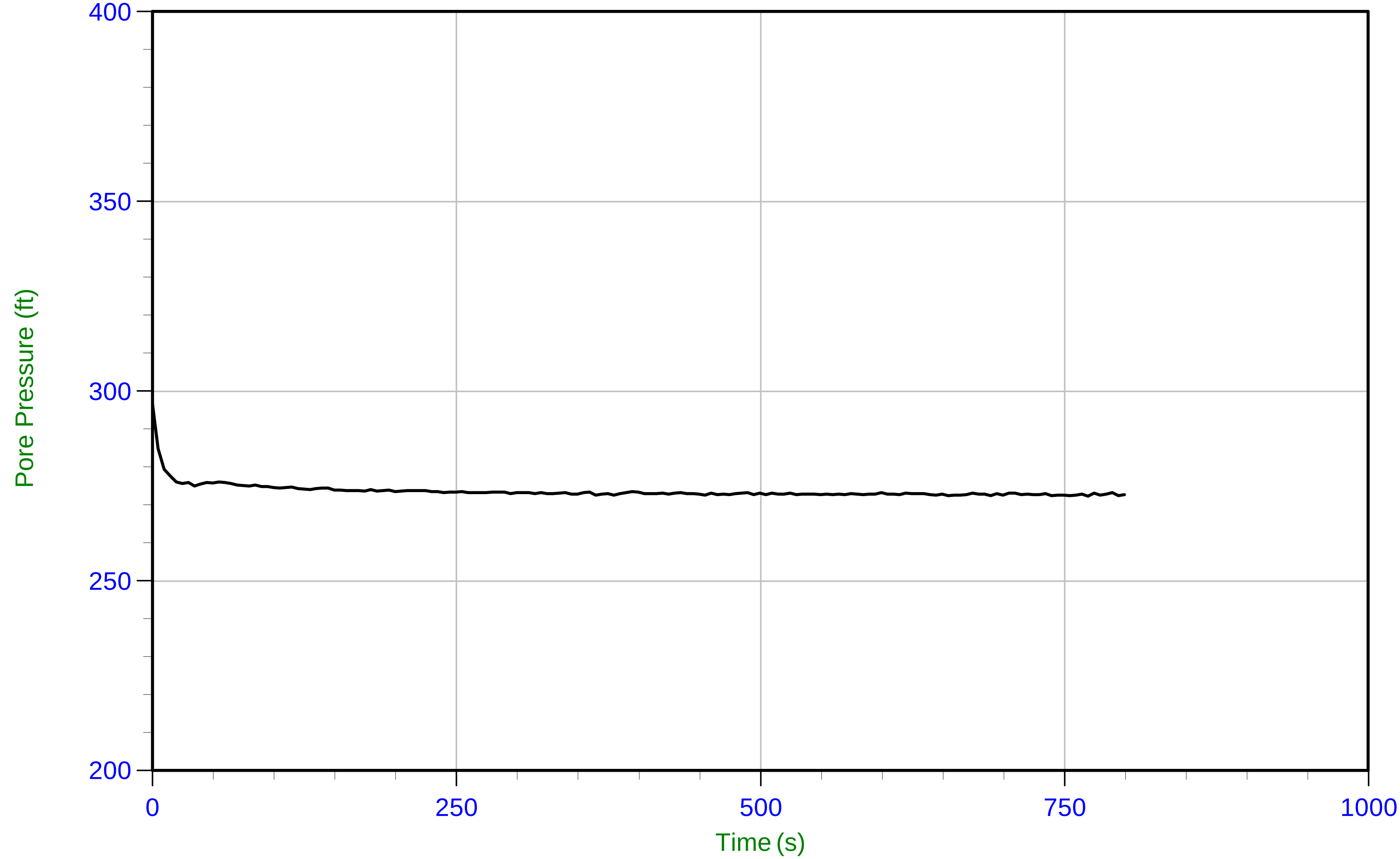
Filename: 17-51001_SP23.PPF
Depth: 58.900 m / 193.239 ft
Duration: 800.0 s

U Min: 95.2 ft
U Max: 395.8 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP23.PPF
Depth: 67.500 m / 221.454 ft
Duration: 800.0 s

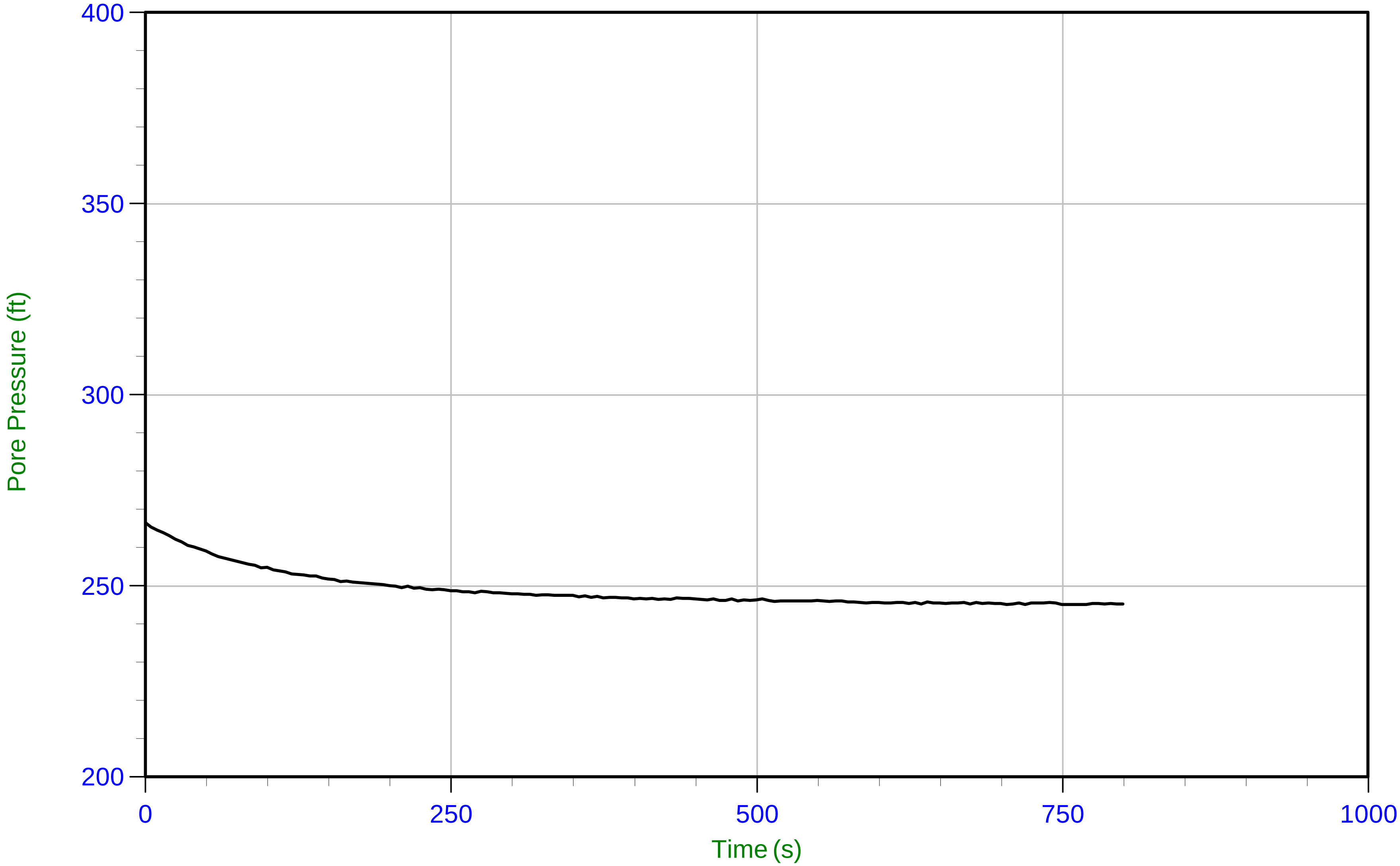
U Min: 272.3 ft
U Max: 296.8 ft

WT: -15.650 m / -51.345 ft
Ueq: 272.8 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 20:26
Site: Fort Knox TSF

Sounding: SCPT17-23
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP23.PPF
Depth: 76.250 m / 250.161 ft
Duration: 800.0 s

U Min: 245.1 ft
U Max: 266.6 ft

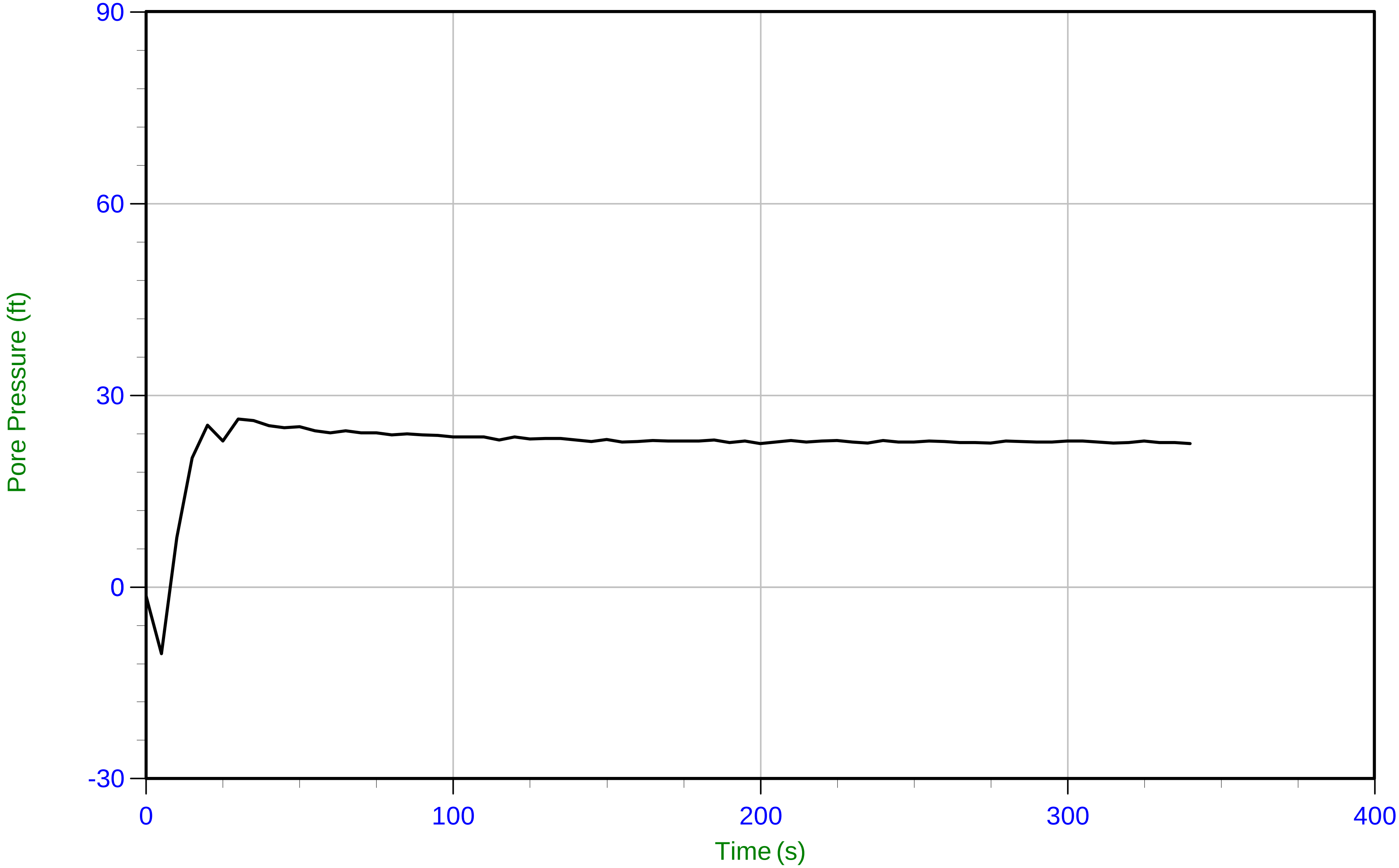
WT: 1.517 m / 4.977 ft
Ueq: 245.2 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 6.650 m / 21.817 ft
Duration: 340.0 s

U Min: -10.4 ft
U Max: 26.3 ft

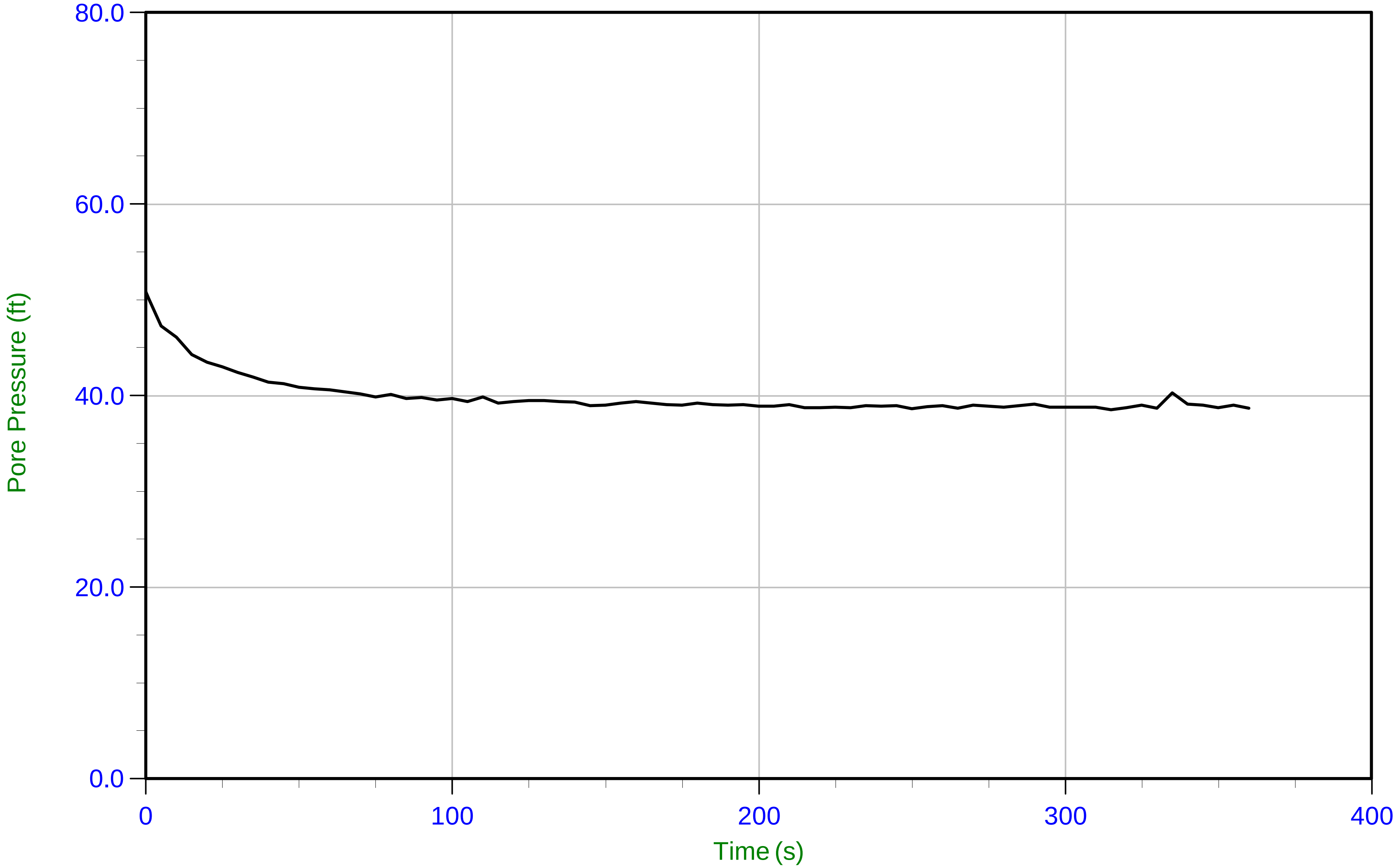
WT: -0.198 m / -0.650 ft
Ueq: 22.5 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 9.725 m / 31.906 ft
Duration: 360.0 s

U Min: 38.5 ft
U Max: 50.8 ft

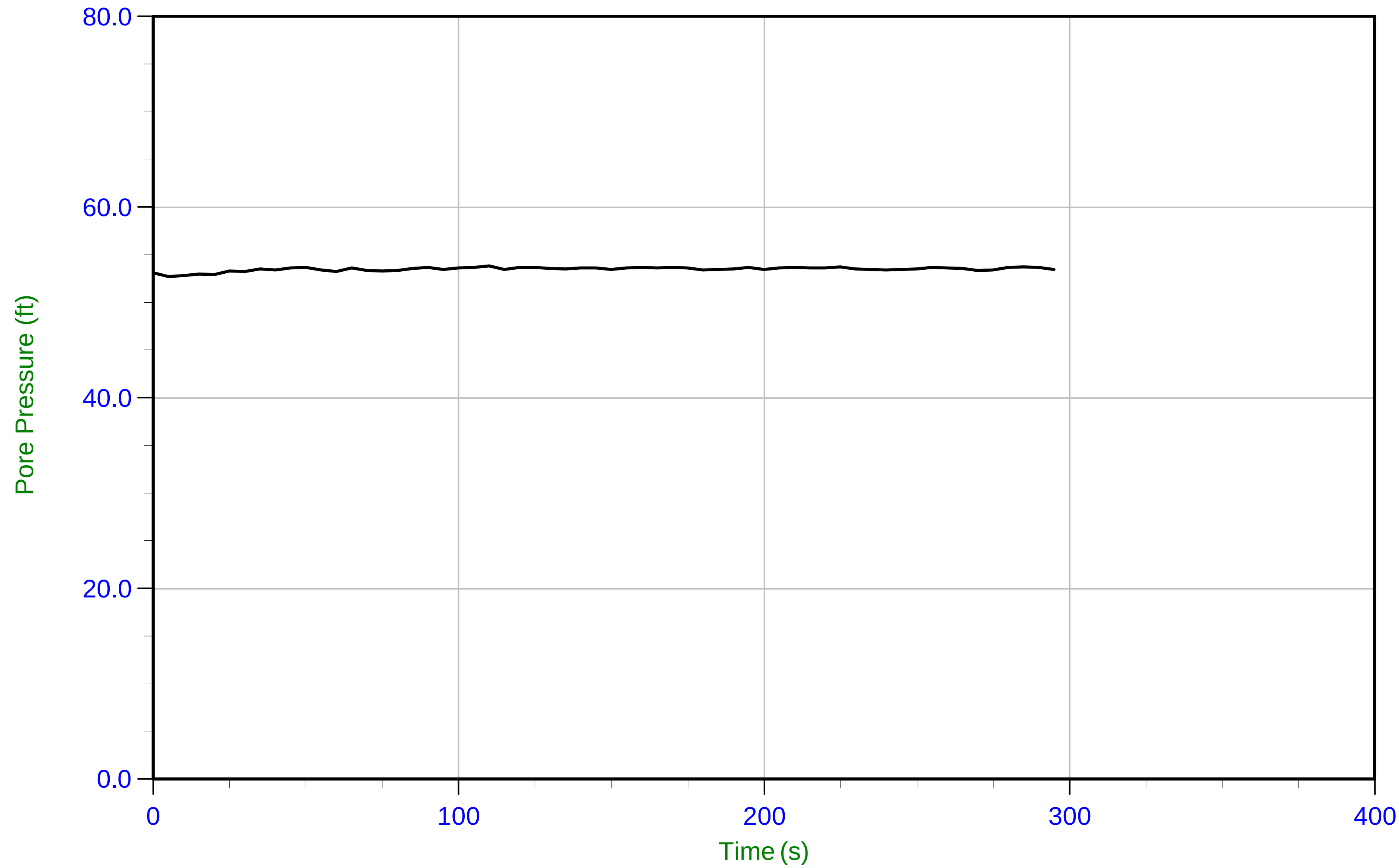
WT: -2.059 m / -6.755 ft
Ueq: 38.7 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 13.800 m / 45.275 ft
Duration: 295.0 s

U Min: 52.7 ft
U Max: 53.8 ft

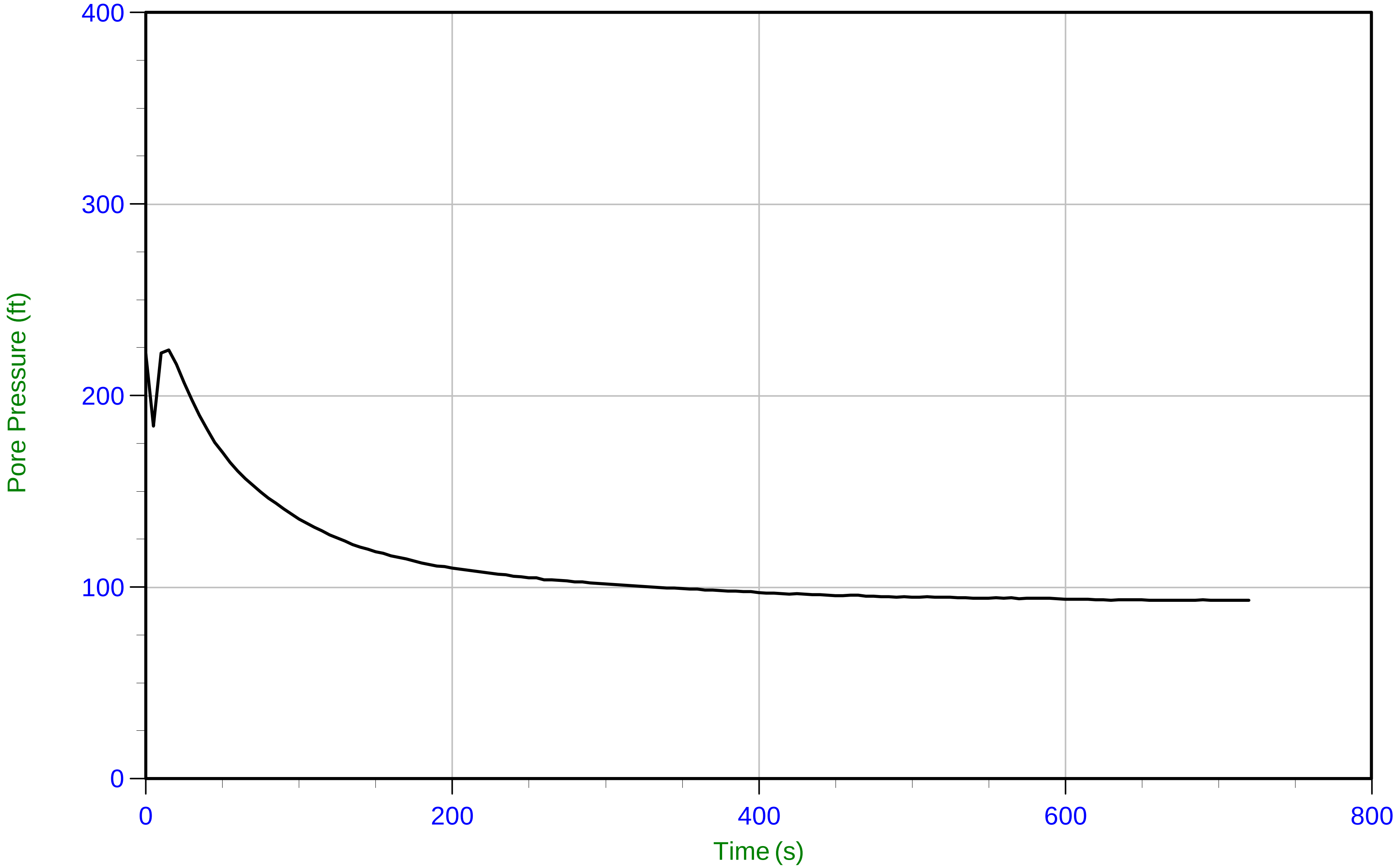
WT: -2.524 m / -8.281 ft
Ueq: 53.6 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 18.900 m / 62.007 ft
Duration: 720.0 s

U Min: 93.1 ft
U Max: 223.9 ft

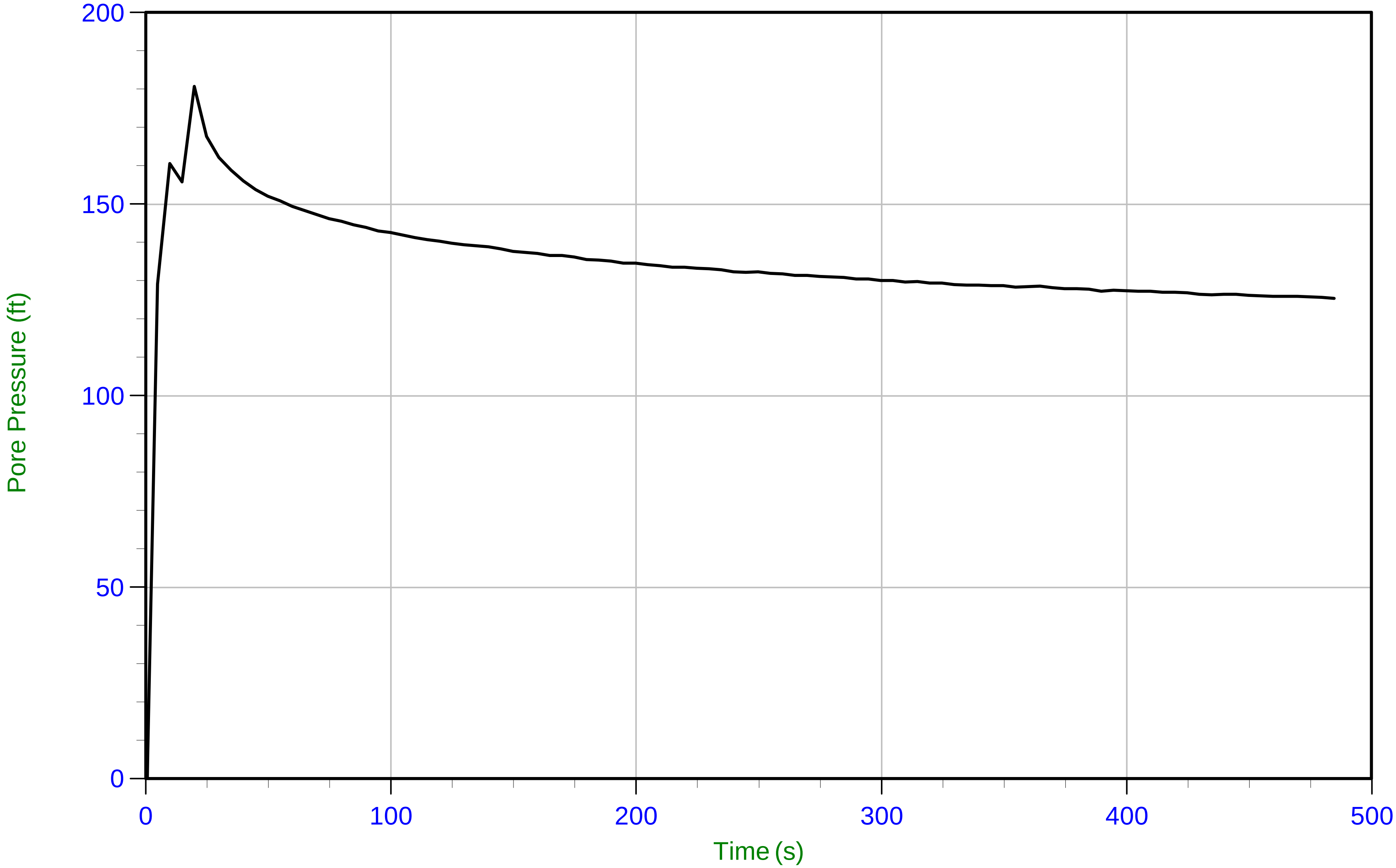
WT: -9.477 m / -31.092 ft
Ueq: 93.1 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 23.750 m / 77.919 ft
Duration: 485.0 s

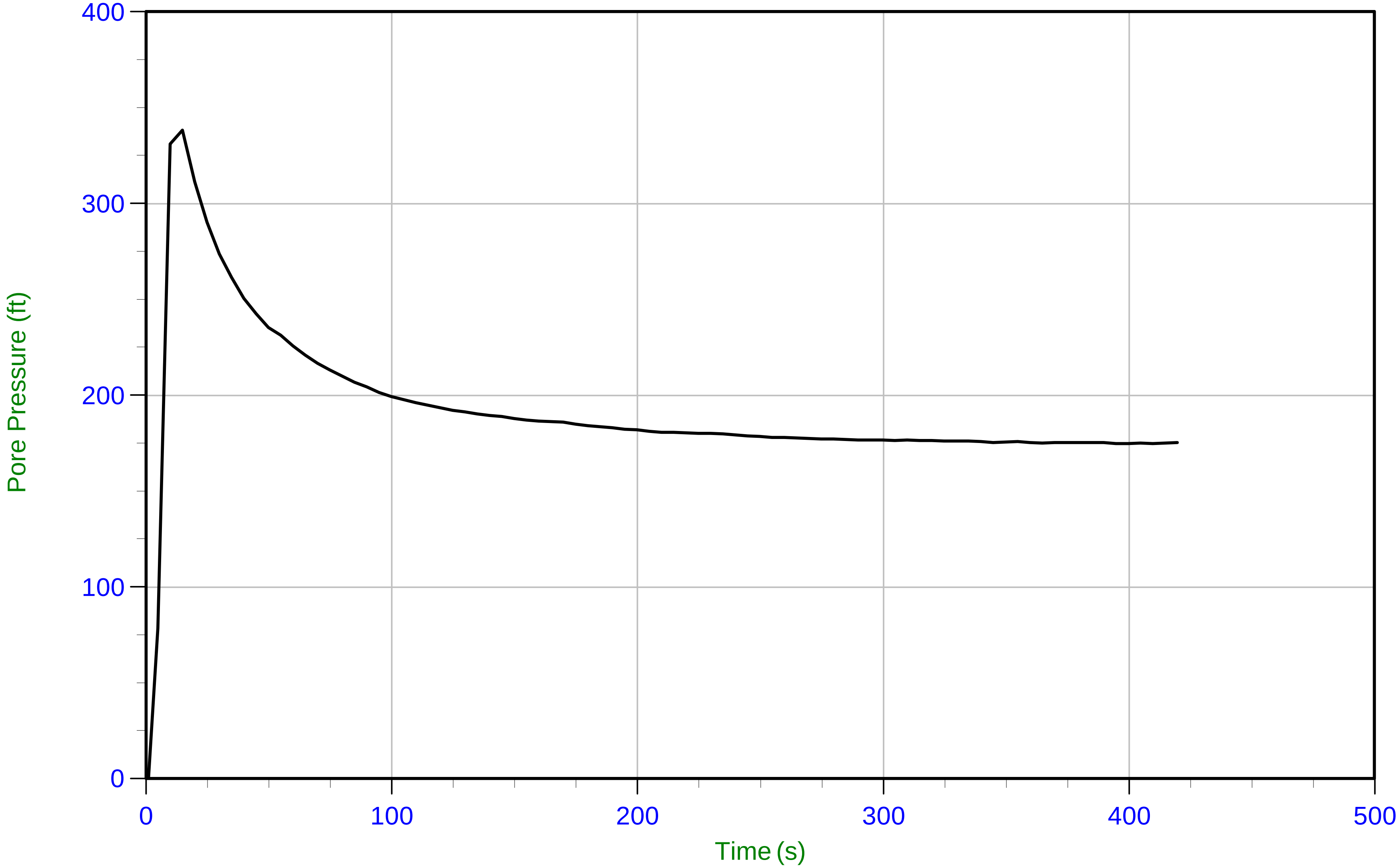
U Min: -22.8 ft
U Max: 180.8 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm^2



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 31.875 m / 104.576 ft
Duration: 420.0 s

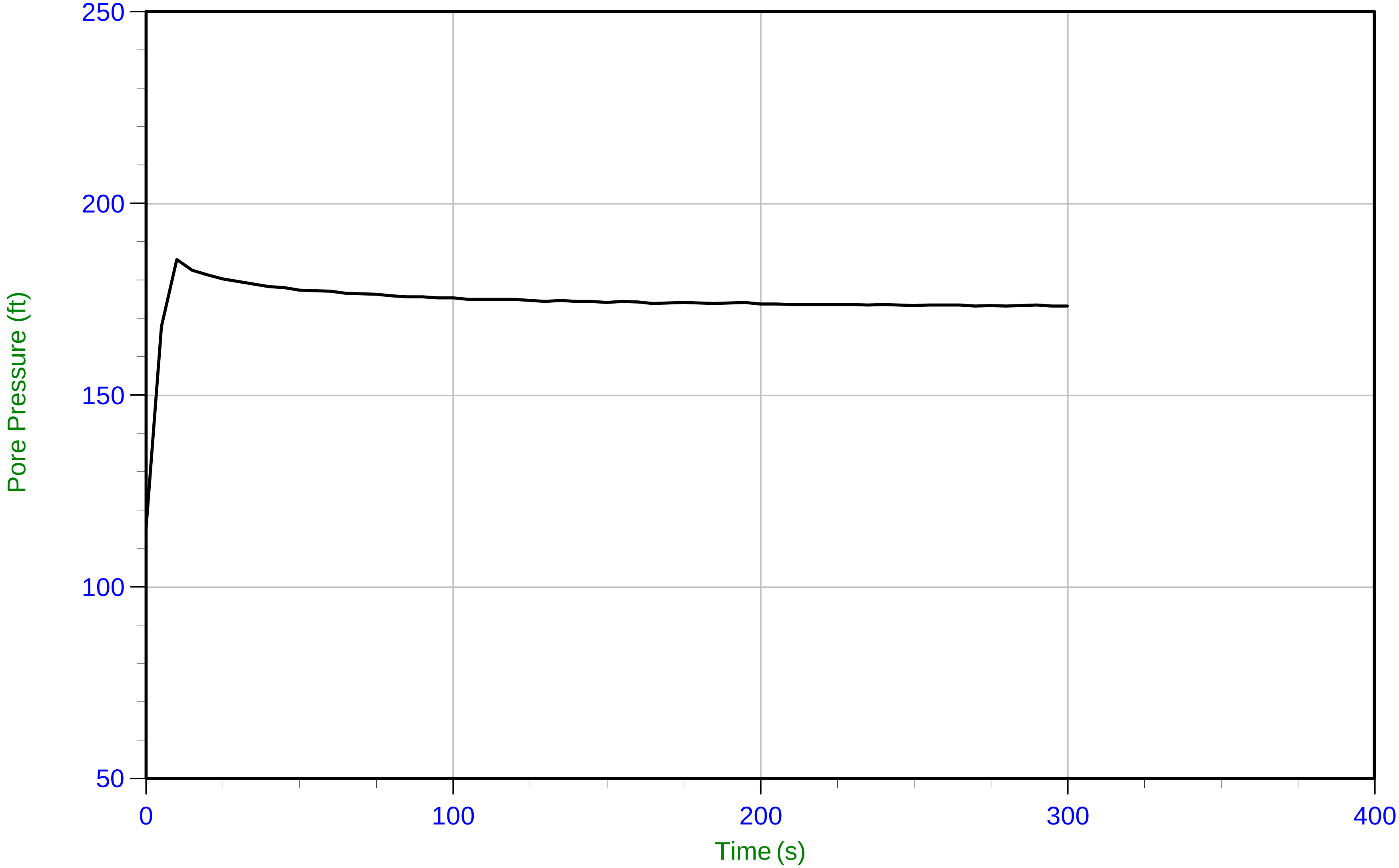
U Min: -23.5 ft
U Max: 338.3 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 37.825 m / 124.096 ft
Duration: 300.0 s

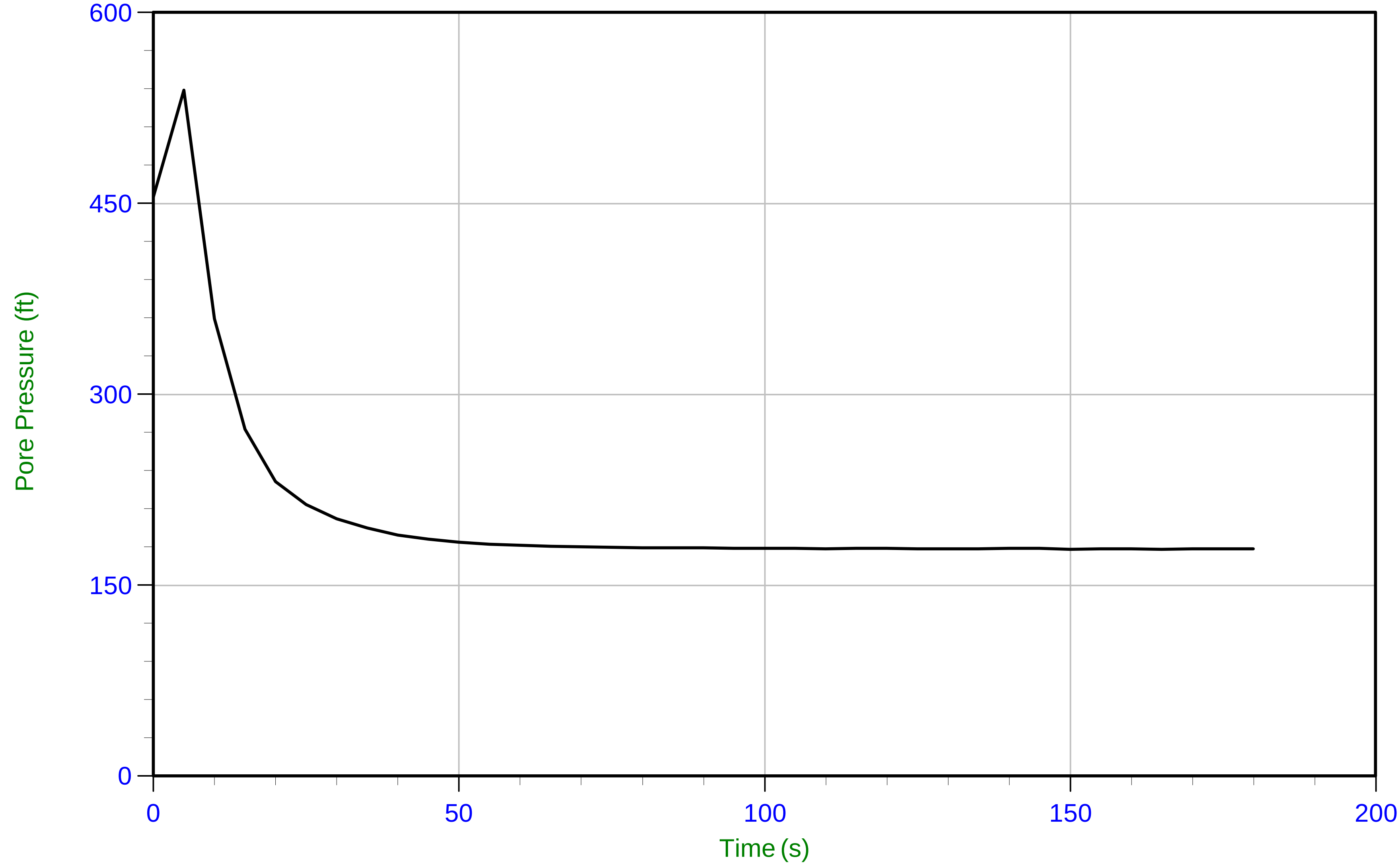
U Min: 115.4 ft
U Max: 185.4 ft

WT: -14.909 m / -48.913 ft
Ueq: 173.0 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 39.700 m / 130.248 ft
Duration: 180.0 s

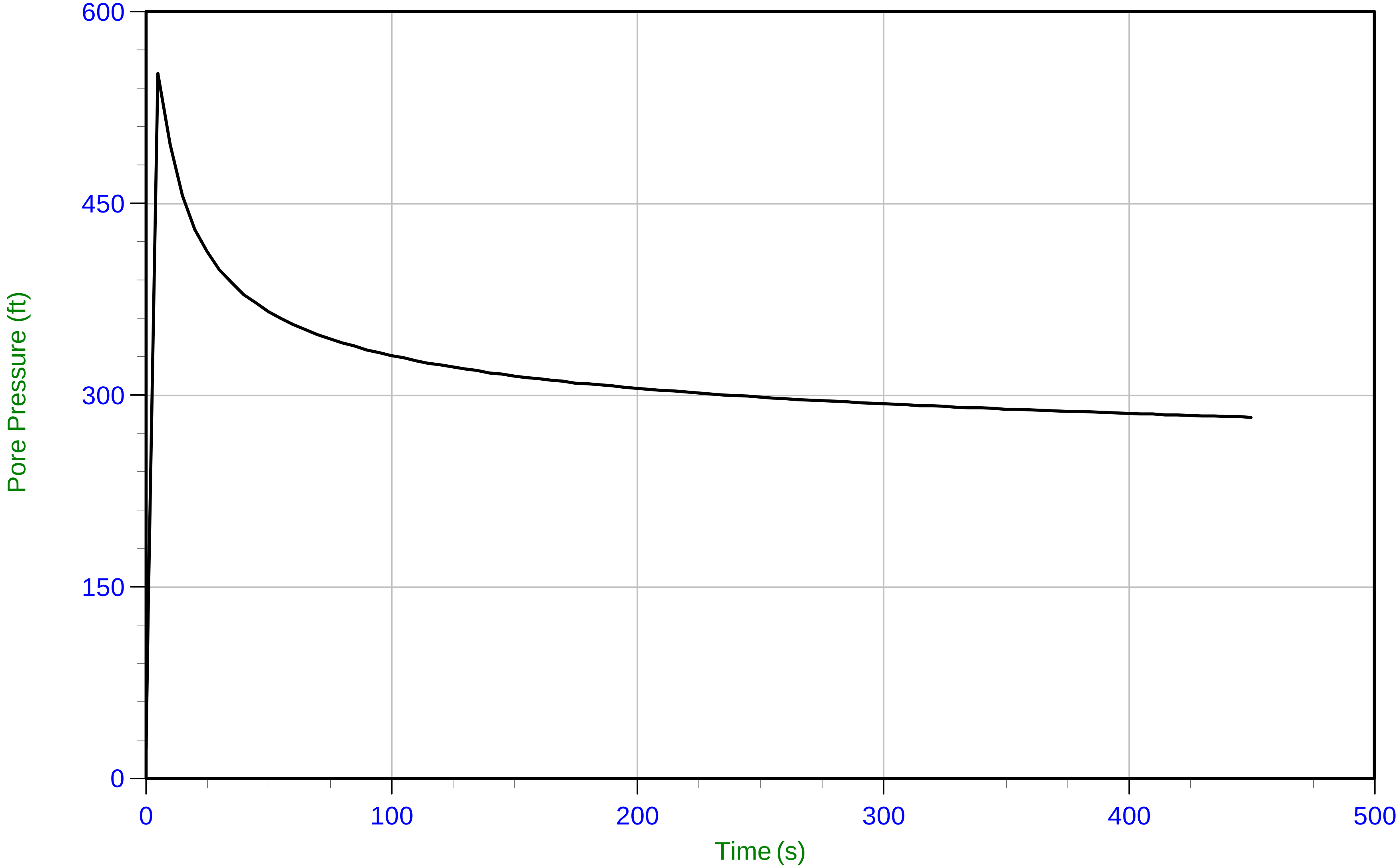
U Min: 178.3 ft
U Max: 538.8 ft

WT: -14.628 m / -47.992 ft
Ueq: 178.2 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

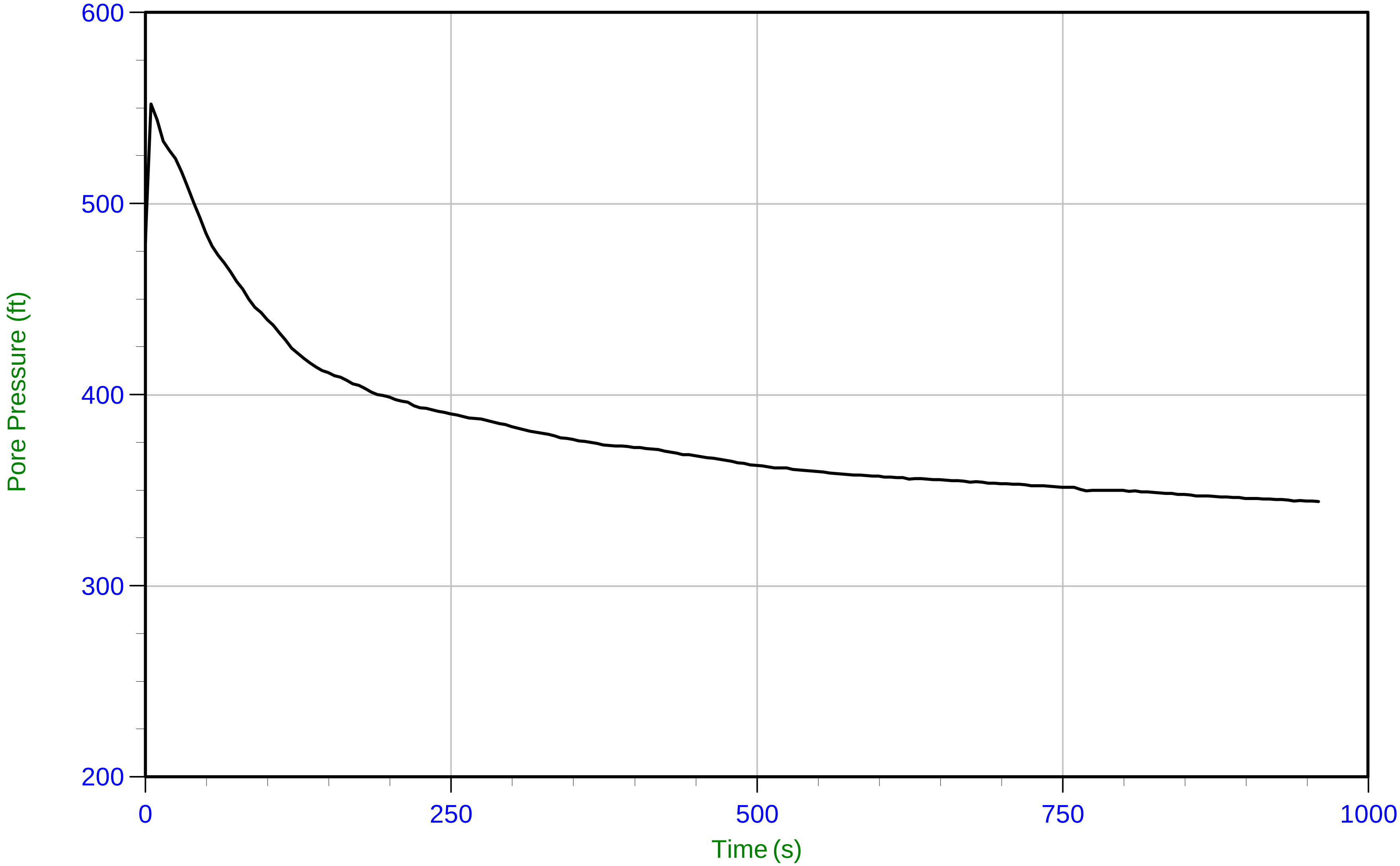
Filename: 17-51001_SP24.PPF
Depth: 43.500 m / 142.715 ft
Duration: 450.0 s

U Min: 22.6 ft
U Max: 551.7 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/03/2017 12:27
Site: Fort Knox TSF

Sounding: SCPT17-24
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP24.PPF
Depth: 51.875 m / 170.192 ft
Duration: 960.0 s

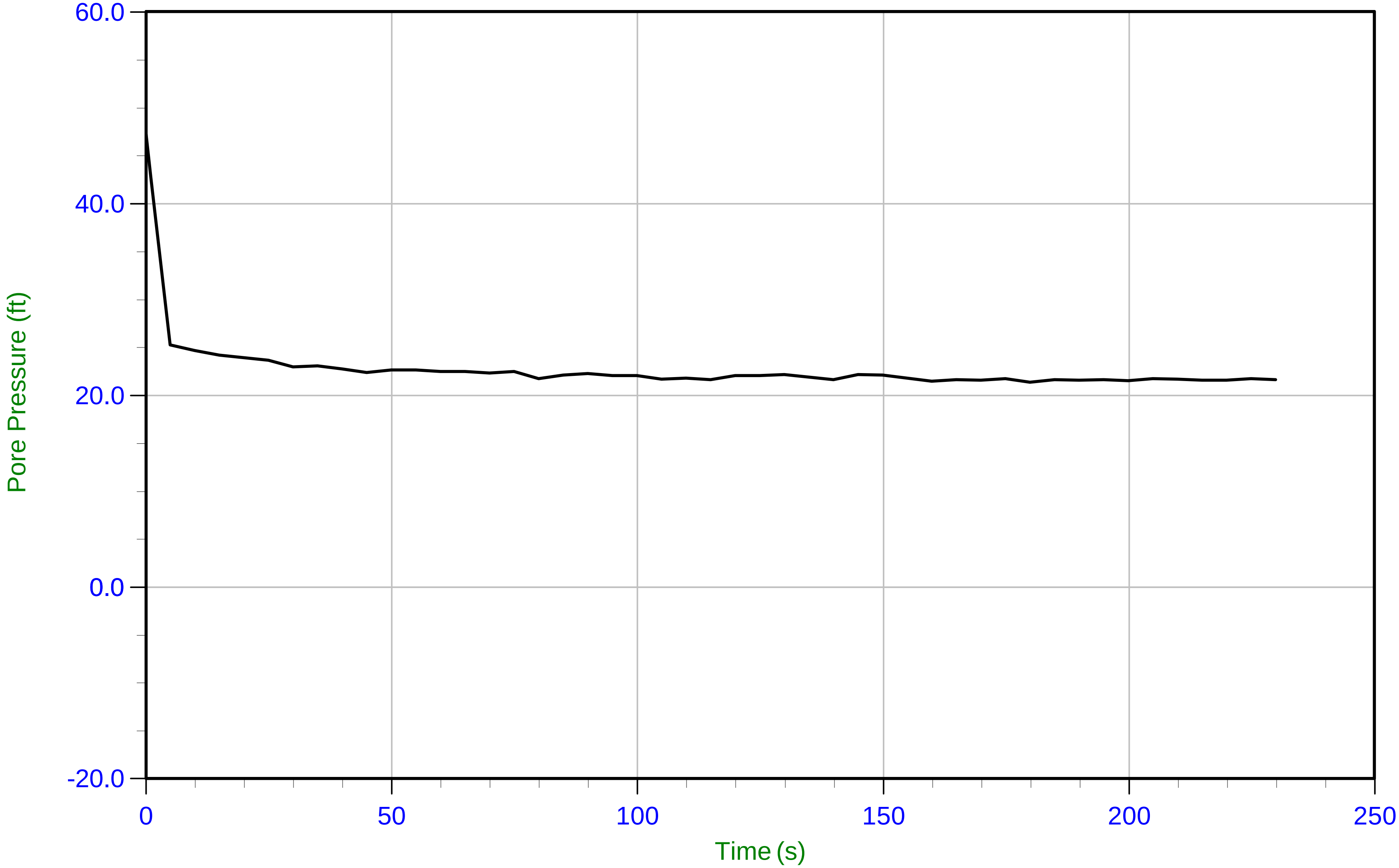
U Min: 344.2 ft
U Max: 552.2 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/02/2017 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP25.PPF
Depth: 5.800 m / 19.029 ft
Duration: 230.0 s

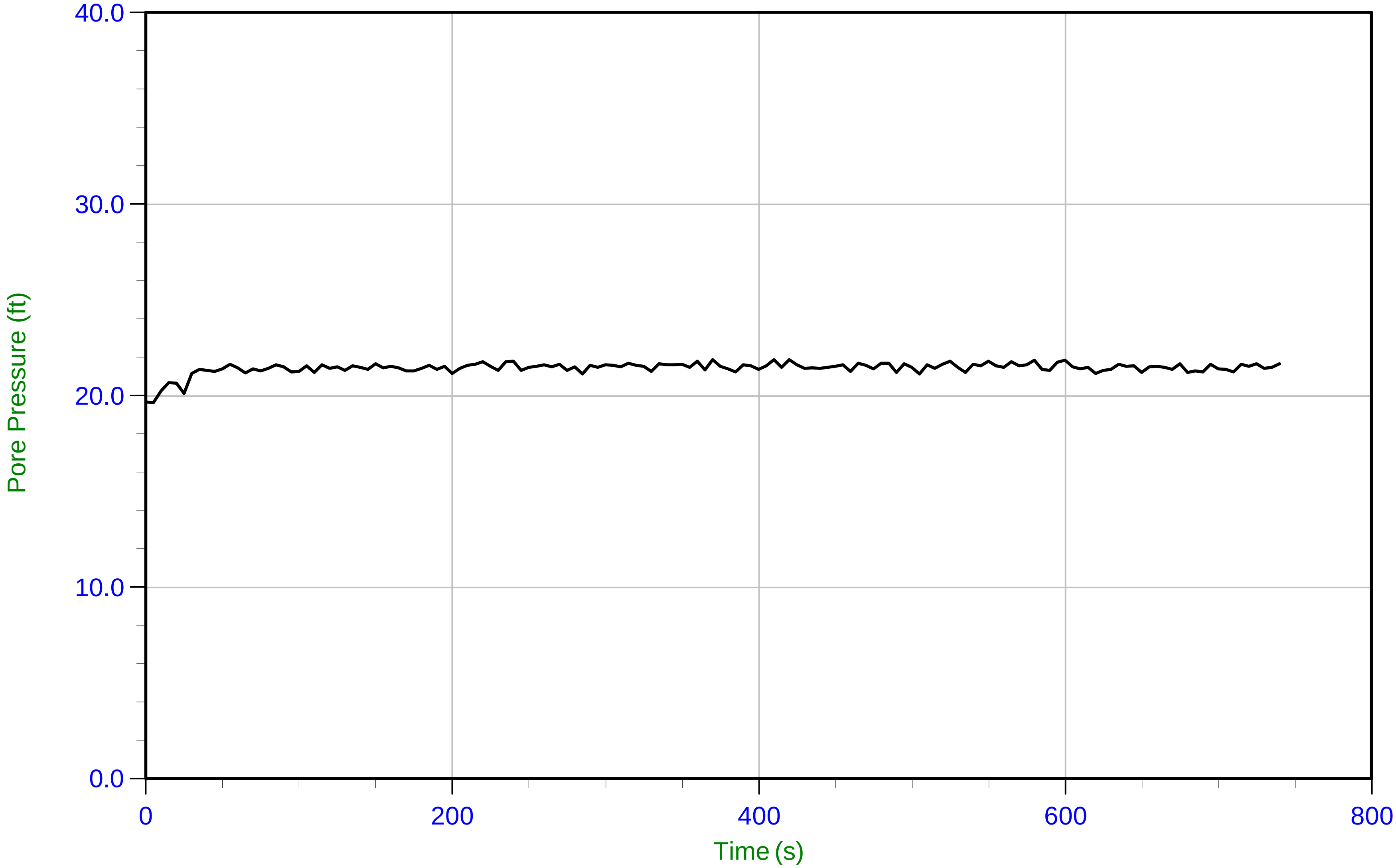
U Min: 21.4 ft
U Max: 47.2 ft

WT: -0.755 m / -2.477 ft
Ueq: 21.5 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/02/2017 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500 Area=15 cm²



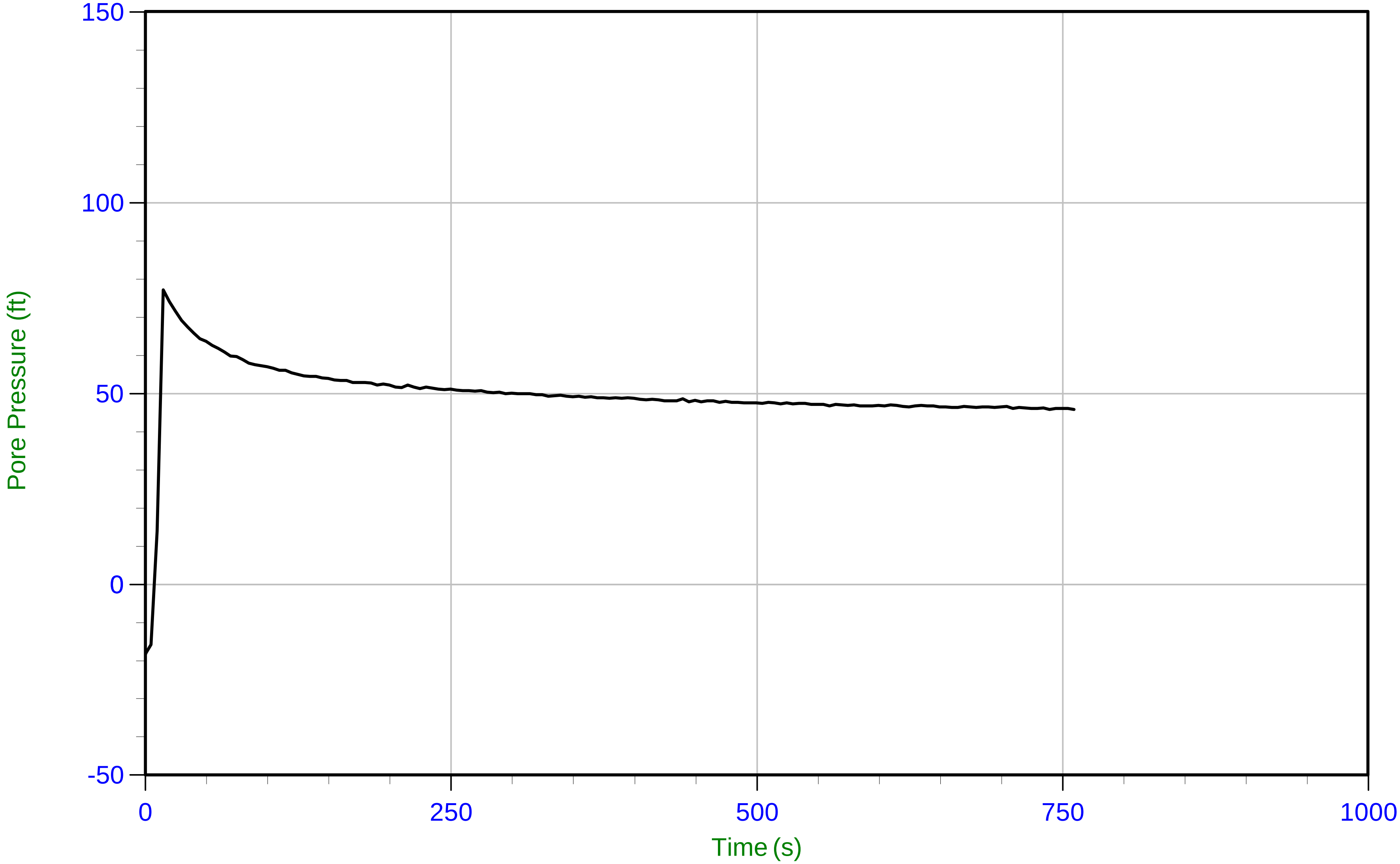
Trace Summary:

Filename: 17-51001_SP25.PPF
Depth: 5.850 m / 19.193 ft
Duration: 740.0 s

U Min: 19.6 ft
U Max: 21.9 ft

WT: -0.705 m / -2.313 ft
Ueq: 21.5 ft

Fairbanks Gold Mining	Job No: 17-51001 Date: 03/02/2017 15:08 Site: Fort Knox TSF	Sounding: SCPT17-25 Cone: 334:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP25.PPF
Depth: 9.050 m / 29.691 ft
Duration: 760.0 s

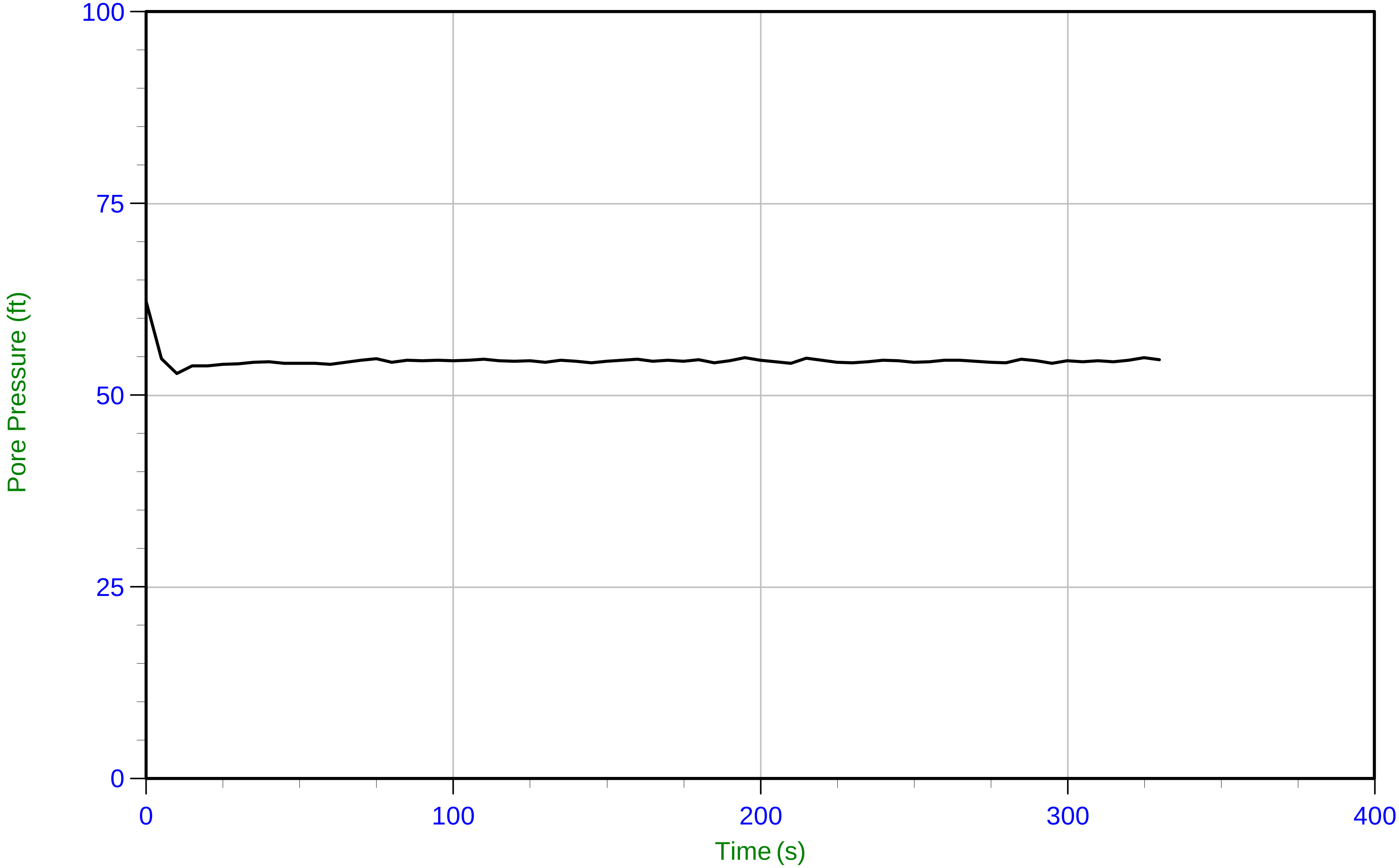
U Min: -18.4 ft
U Max: 77.1 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/02/2017 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500 Area=15 cm²



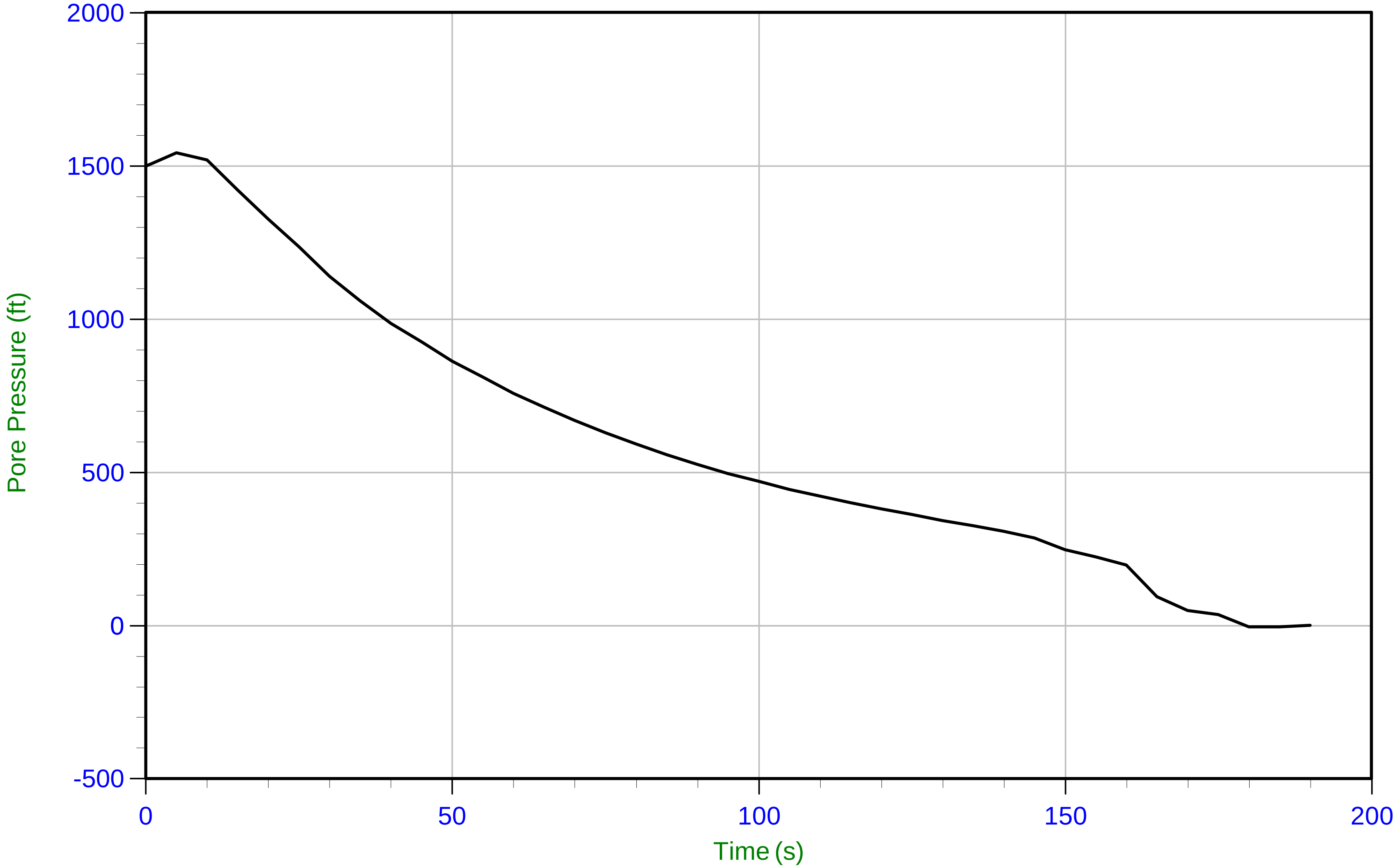
Trace Summary:

Filename: 17-51001_SP25.PPF
Depth: 13.575 m / 44.537 ft
Duration: 330.0 s

U Min: 52.9 ft
U Max: 62.3 ft

WT: -3.004 m / -9.856 ft
Ueq: 54.4 ft

Fairbanks Gold Mining	Job No: 17-51001 Date: 03/02/2017 15:08 Site: Fort Knox TSF	Sounding: SCPT17-25 Cone: 334:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP25.PPF
Depth: 16.100 m / 52.821 ft
Duration: 190.0 s

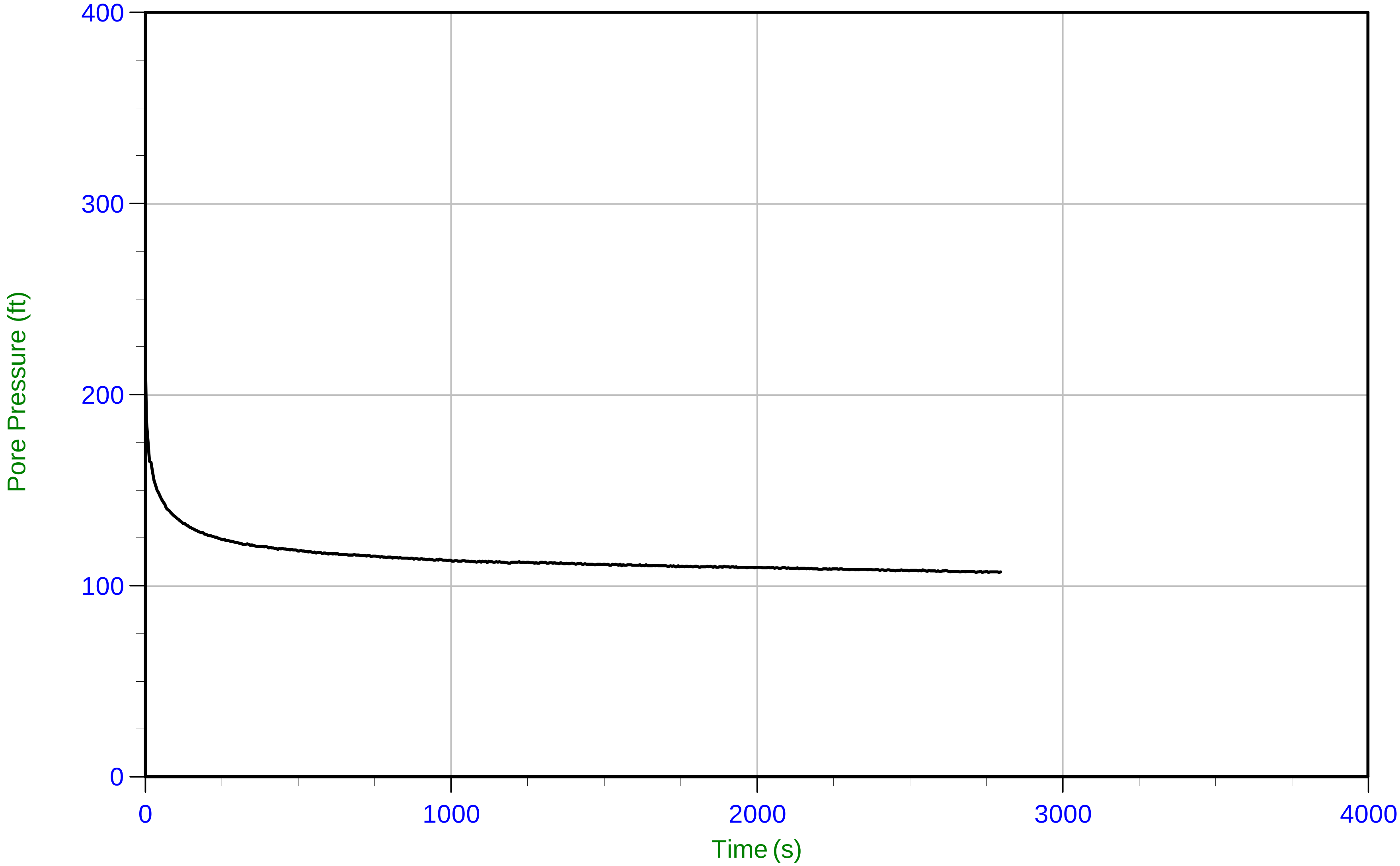
U Min: -3.9 ft
U Max: 1542.8 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/02/2017 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP25.PPF
Depth: 22.250 m / 72.998 ft
Duration: 2800.0 s

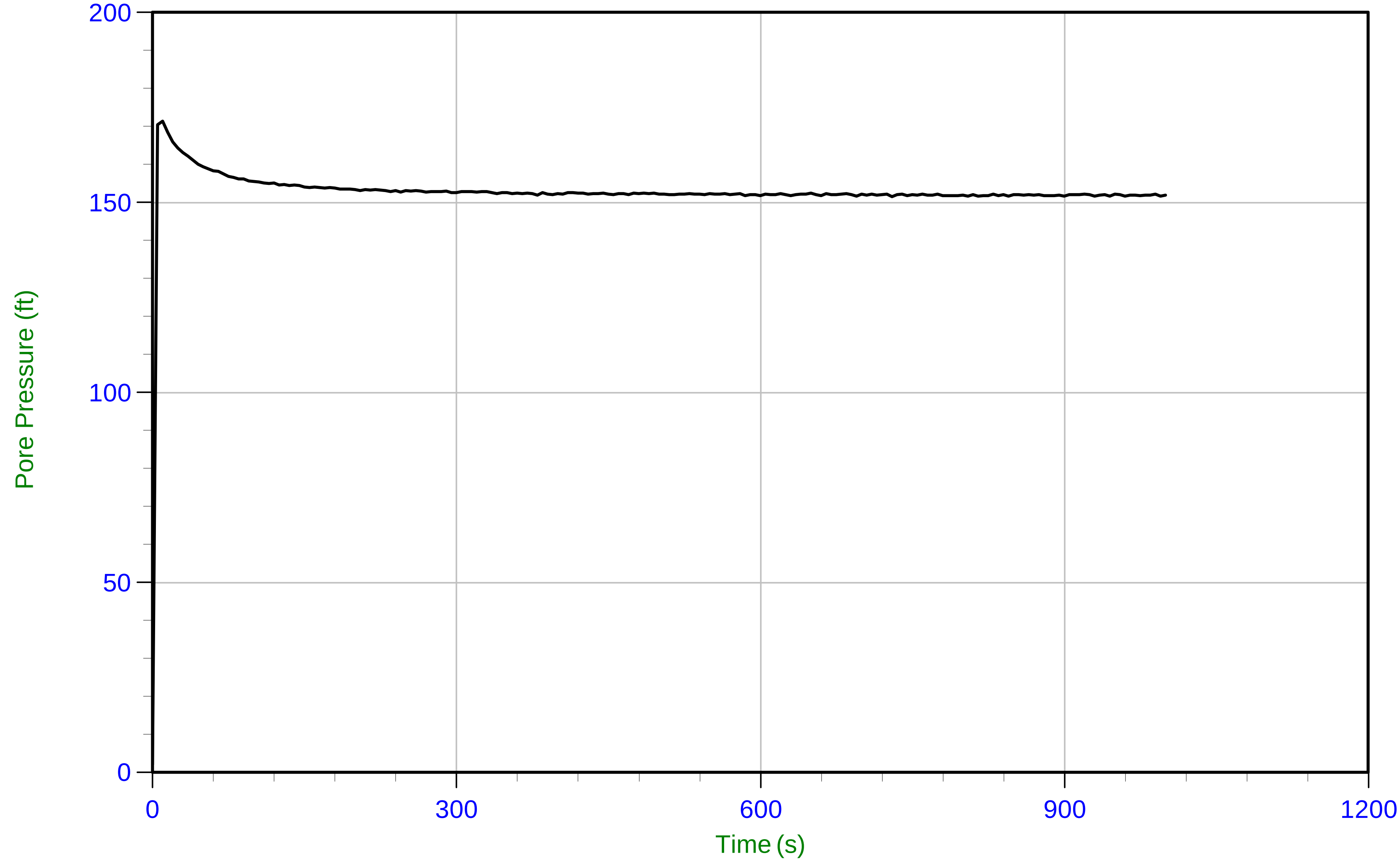
U Min: 107.0 ft
U Max: 225.3 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/02/2017 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP25.PPF
Depth: 32.950 m / 108.102 ft
Duration: 1000.0 s

U Min: 2.0 ft
U Max: 171.5 ft

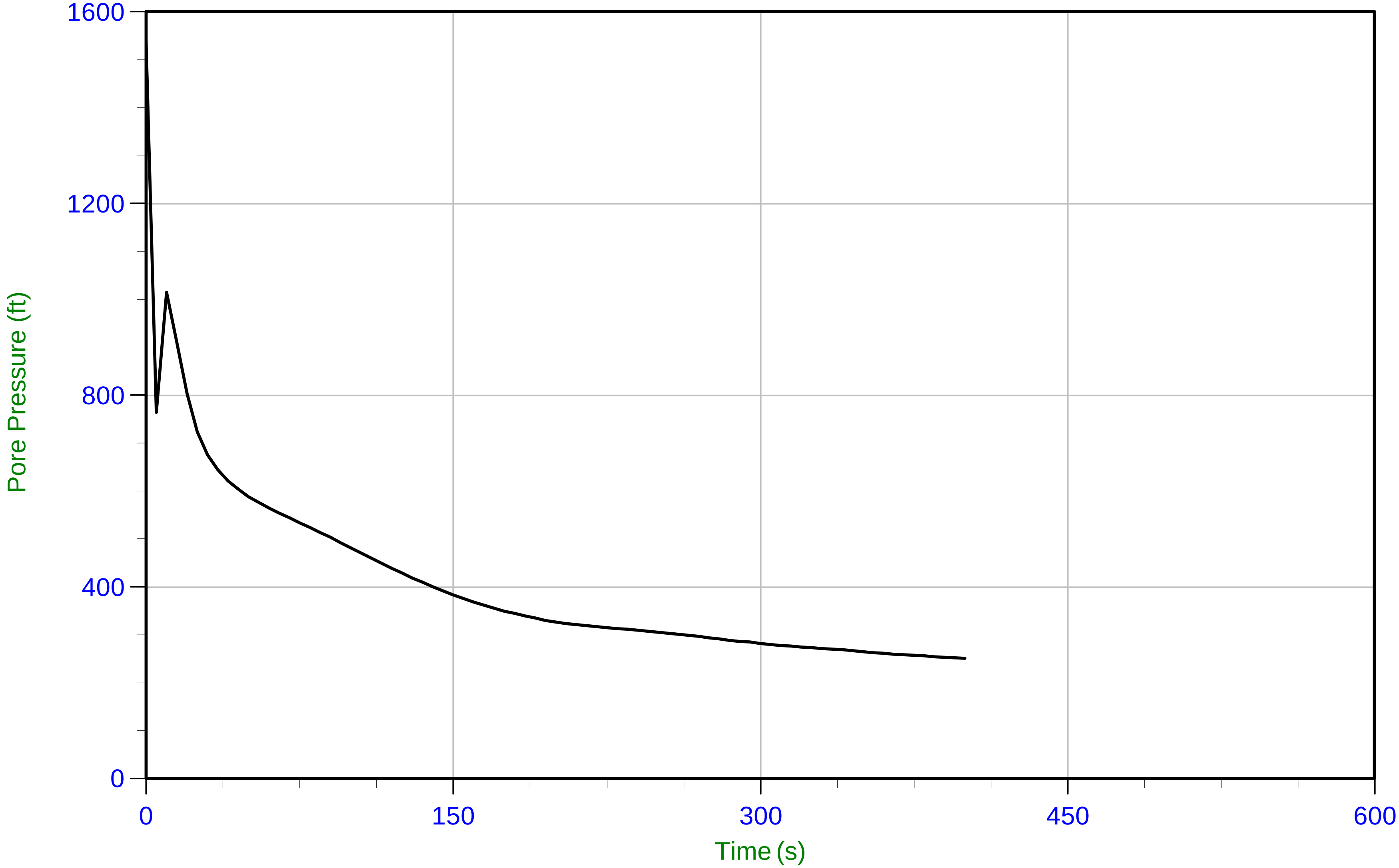
WT: -13.216 m / -43.359 ft
Ueq: 151.5 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/02/2017 15:08
Site: Fort Knox TSF

Sounding: SCPT17-25
Cone: 334:T1500F15U500 Area=15 cm²



Trace Summary:

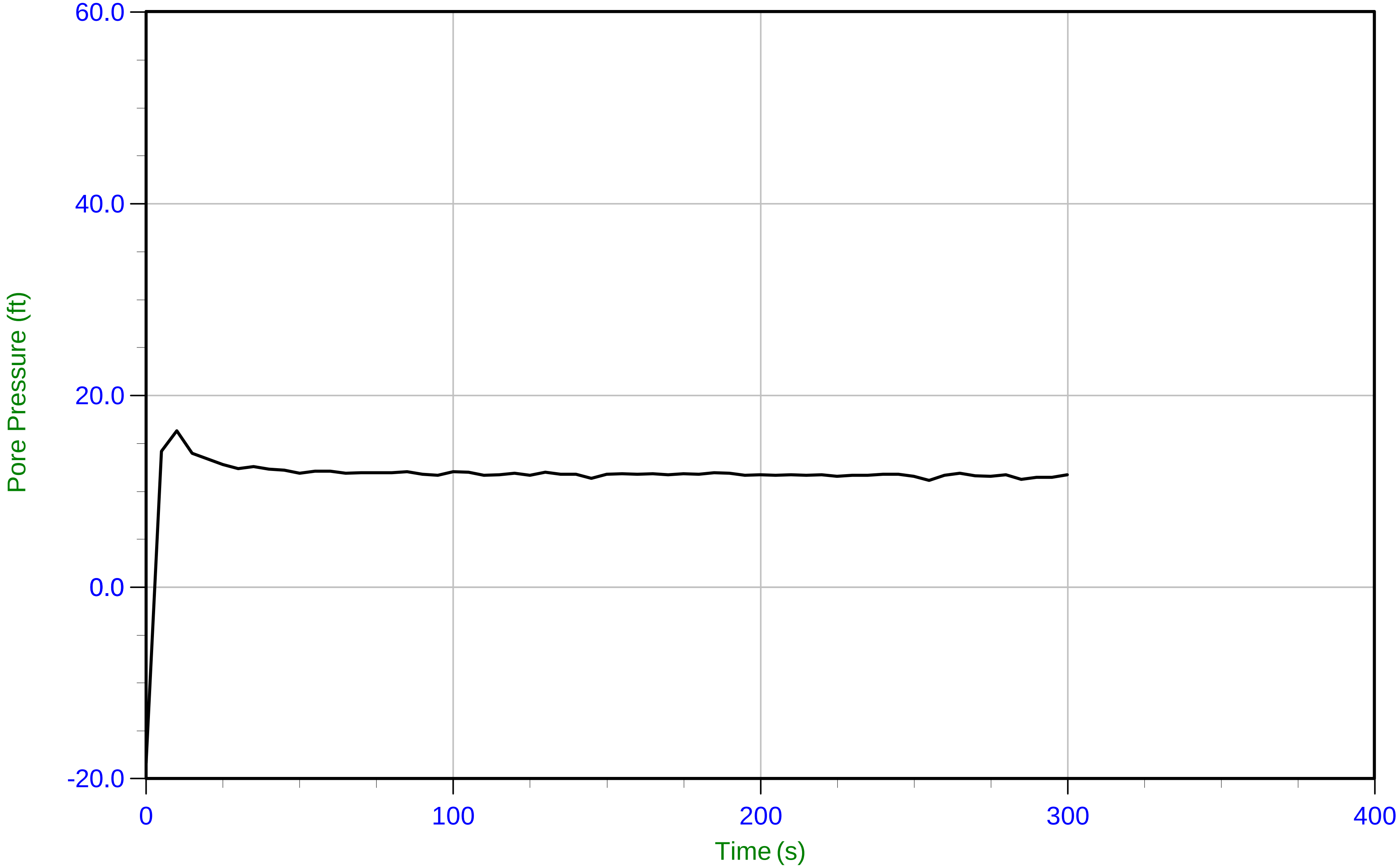
Filename: 17-51001_SP25.PPF
Depth: 42.100 m / 138.122 ft
Duration: 400.0 s

U Min: 251.6 ft
U Max: 1537.2 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/08/2017 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP26.PPF
Depth: 7.275 m / 23.868 ft
Duration: 300.0 s

U Min: -18.4 ft
U Max: 16.3 ft

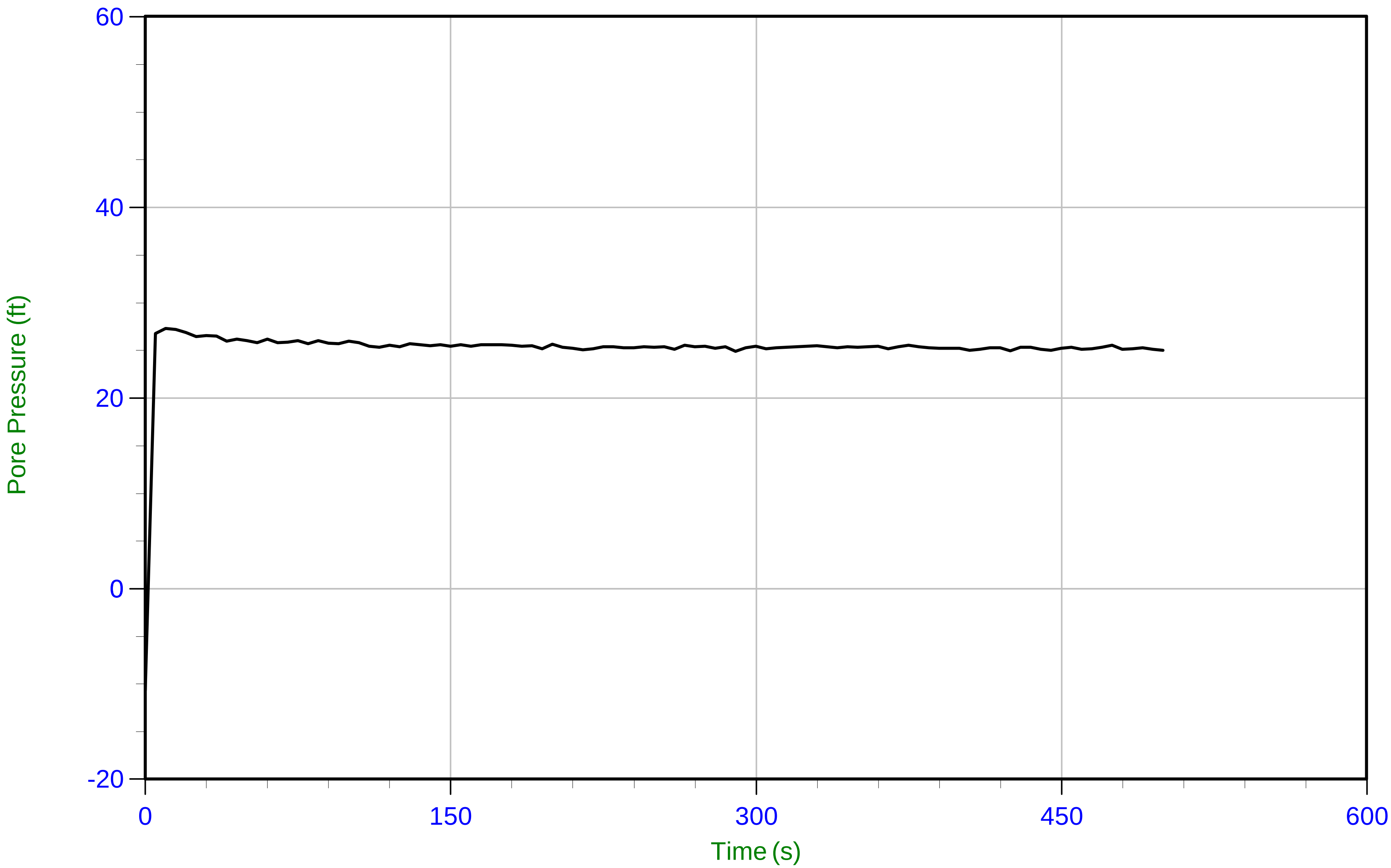
WT: 3.781 m / 12.405 ft
Ueq: 11.5 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/08/2017 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP26.PPF
Depth: 14.250 m / 46.751 ft
Duration: 500.0 s

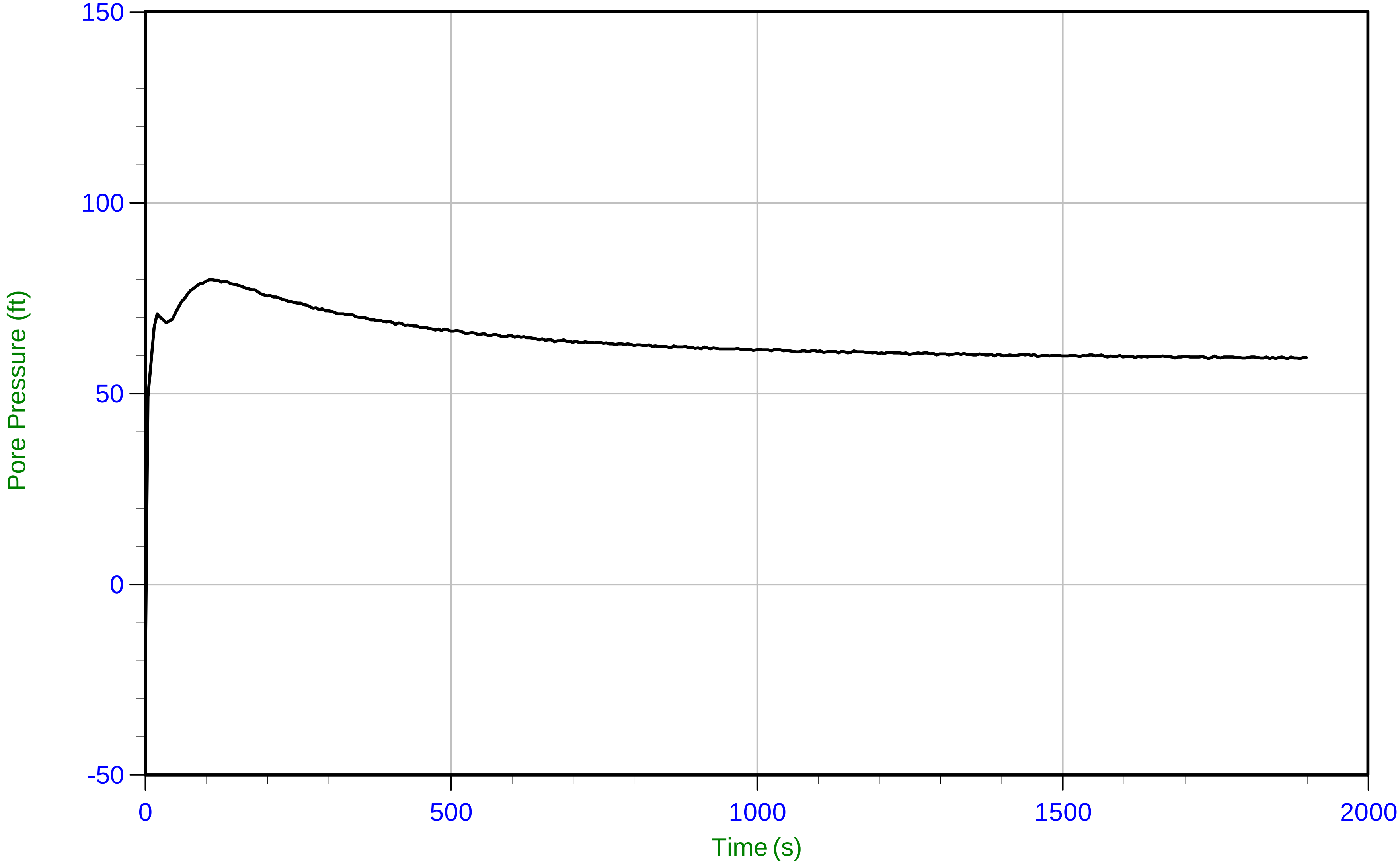
U Min: -10.7 ft
U Max: 27.3 ft

WT: 6.624 m / 21.732 ft
Ueq: 25.0 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/08/2017 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP26.PPF
Depth: 20.325 m / 66.682 ft
Duration: 1900.0 s

U Min: -20.4 ft
U Max: 79.9 ft

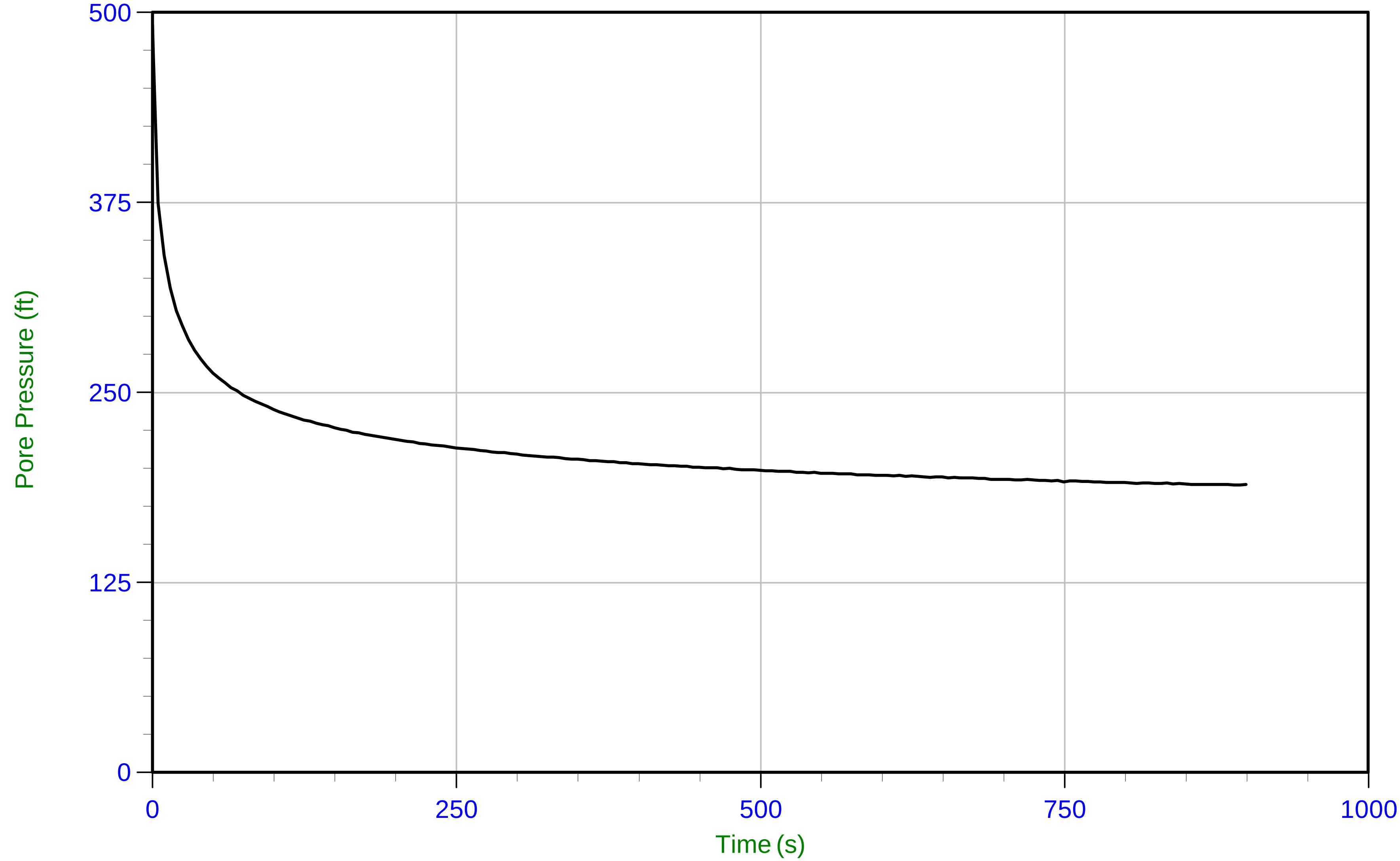
WT: 2.279 m / 7.477 ft
Ueq: 59.2 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/08/2017 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K Area=15 cm²



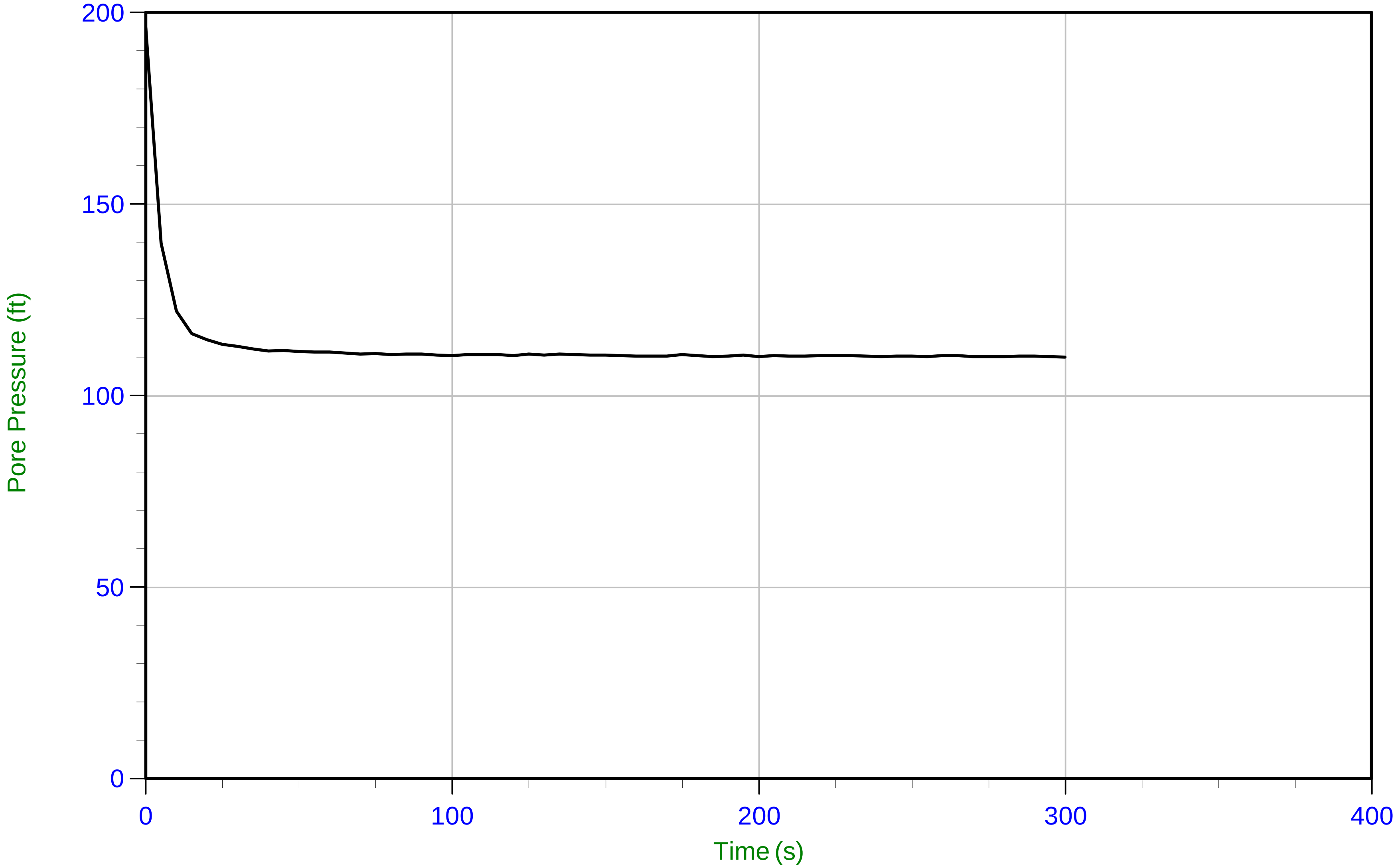
Trace Summary:

Filename: 17-51001_SP26.PPF
Depth: 30.275 m / 99.326 ft
Duration: 900.0 s

U Min: 189.0 ft
U Max: 492.2 ft

CONETEC

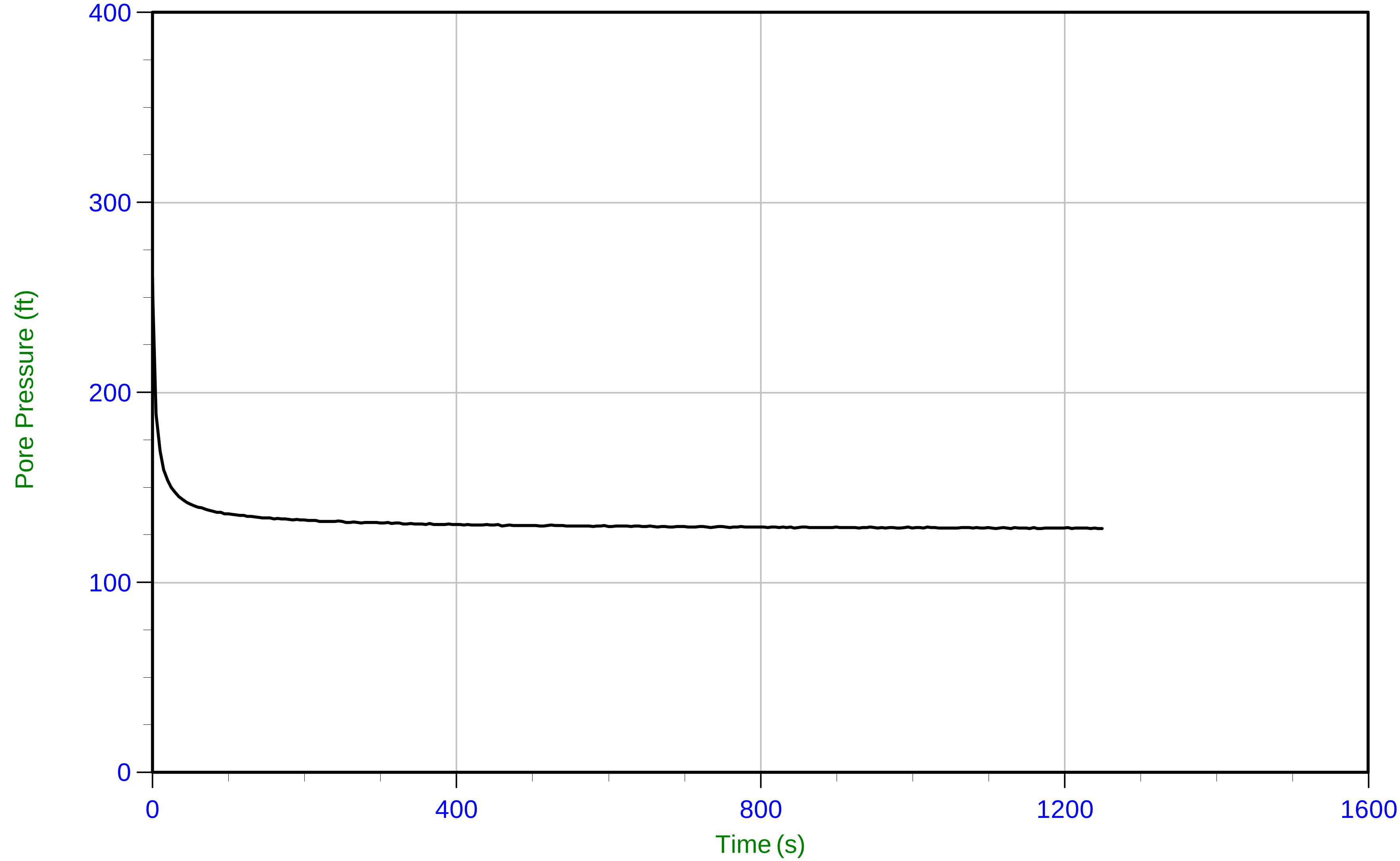
Fairbanks Gold Mining	Job No: 17-51001 Date: 03/08/2017 20:00 Site: Fort Knox TSF	Sounding: SCPT17-26 Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP26.PPF	U Min: 110.1 ft	WT: 3.507 m / 11.506 ft
Depth: 37.175 m / 121.964 ft	U Max: 196.1 ft	Ueq: 110.5 ft
Duration: 300.0 s		

Fairbanks Gold Mining	Job No: 17-51001 Date: 03/08/2017 20:00 Site: Fort Knox TSF	Sounding: SCPT17-26 Cone: 473:T1500F15U1K Area=15 cm²



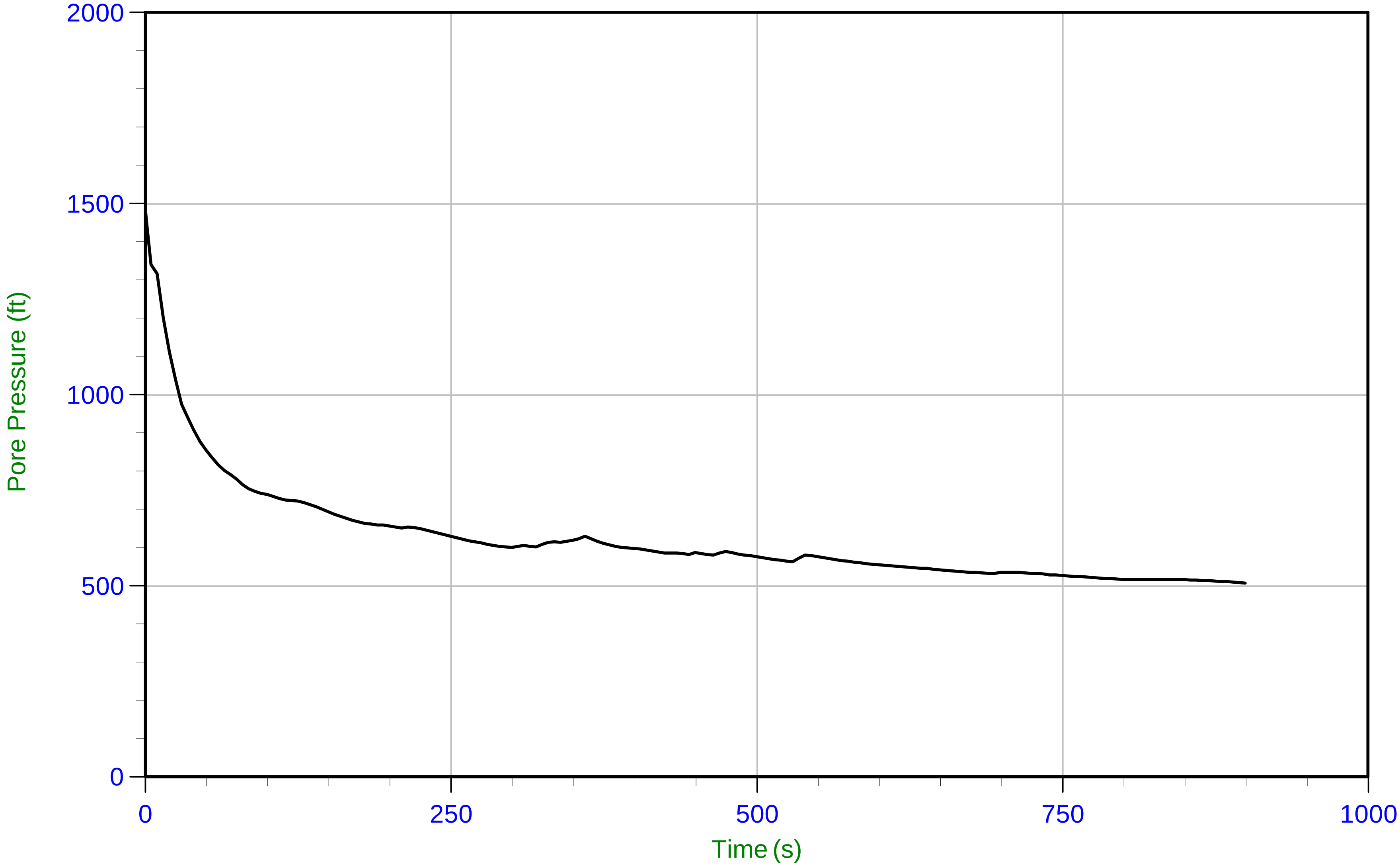
Trace Summary:

Filename: 17-51001_SP26.PPF	U Min: 128.4 ft	WT: 5.120 m / 16.798 ft
Depth: 44.400 m / 145.668 ft	U Max: 260.7 ft	Ueq: 128.9 ft
Duration: 1250.0 s		

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/08/2017 20:00
Site: Fort Knox TSF

Sounding: SCPT17-26
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP26.PPF
Depth: 55.700 m / 182.741 ft
Duration: 900.0 s

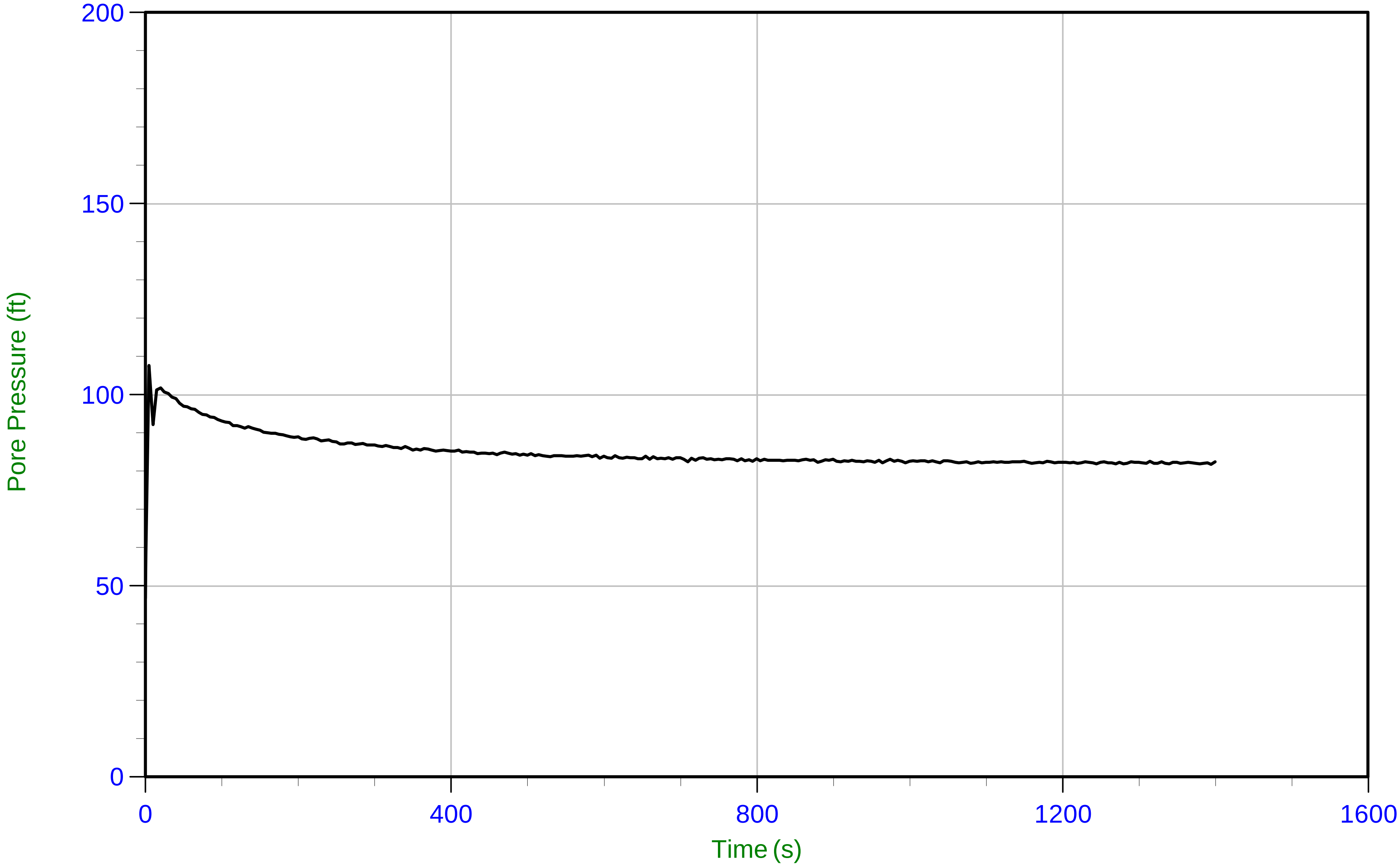
U Min: 508.0 ft
U Max: 1484.3 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP27.PPF
Depth: 17.800 m / 58.398 ft
Duration: 1400.0 s

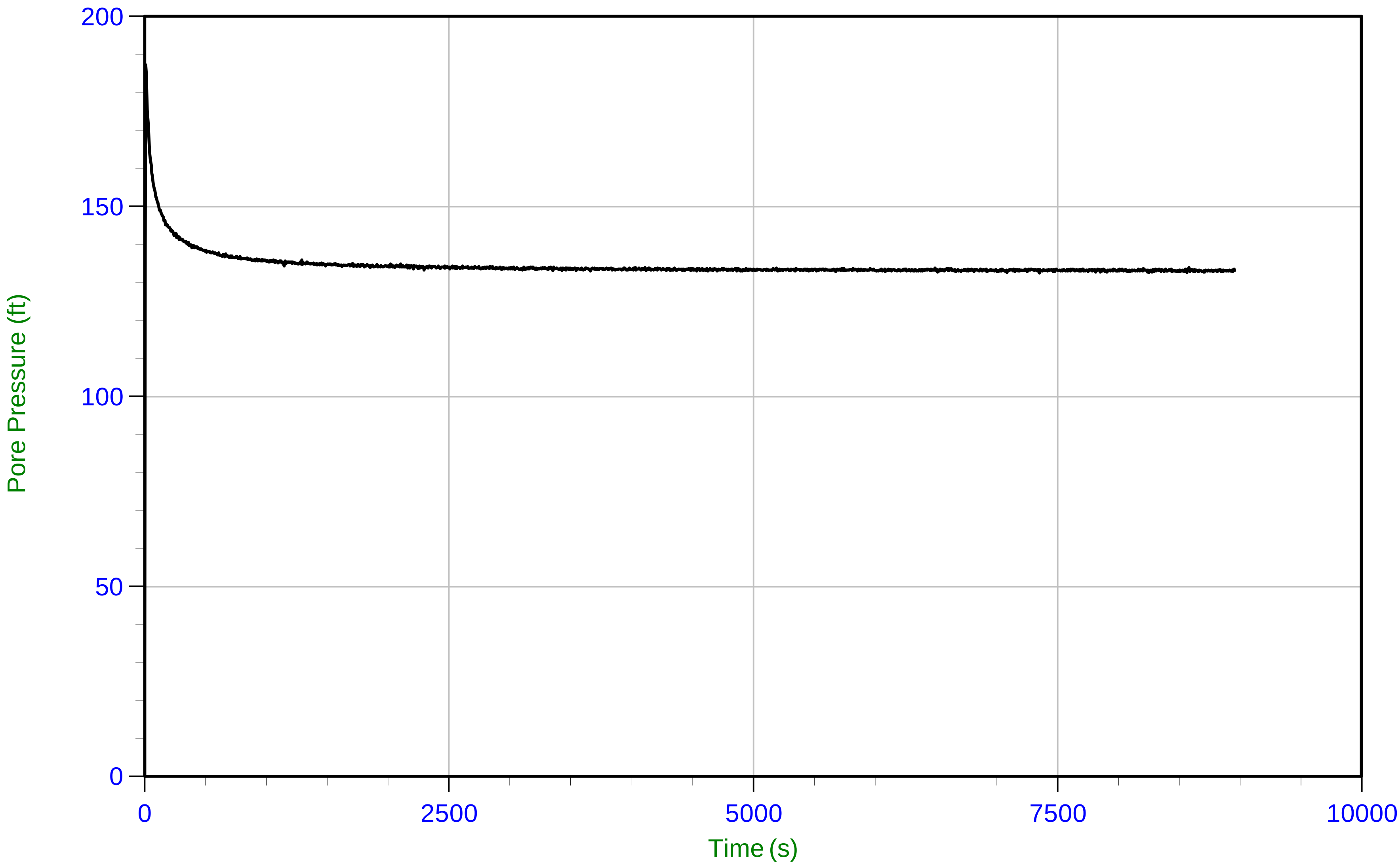
U Min: 46.7 ft
U Max: 107.6 ft

WT: -7.069 m / -23.192 ft
Ueq: 81.6 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP27.PPF
Depth: 26.475 m / 86.859 ft
Duration: 8960.0 s

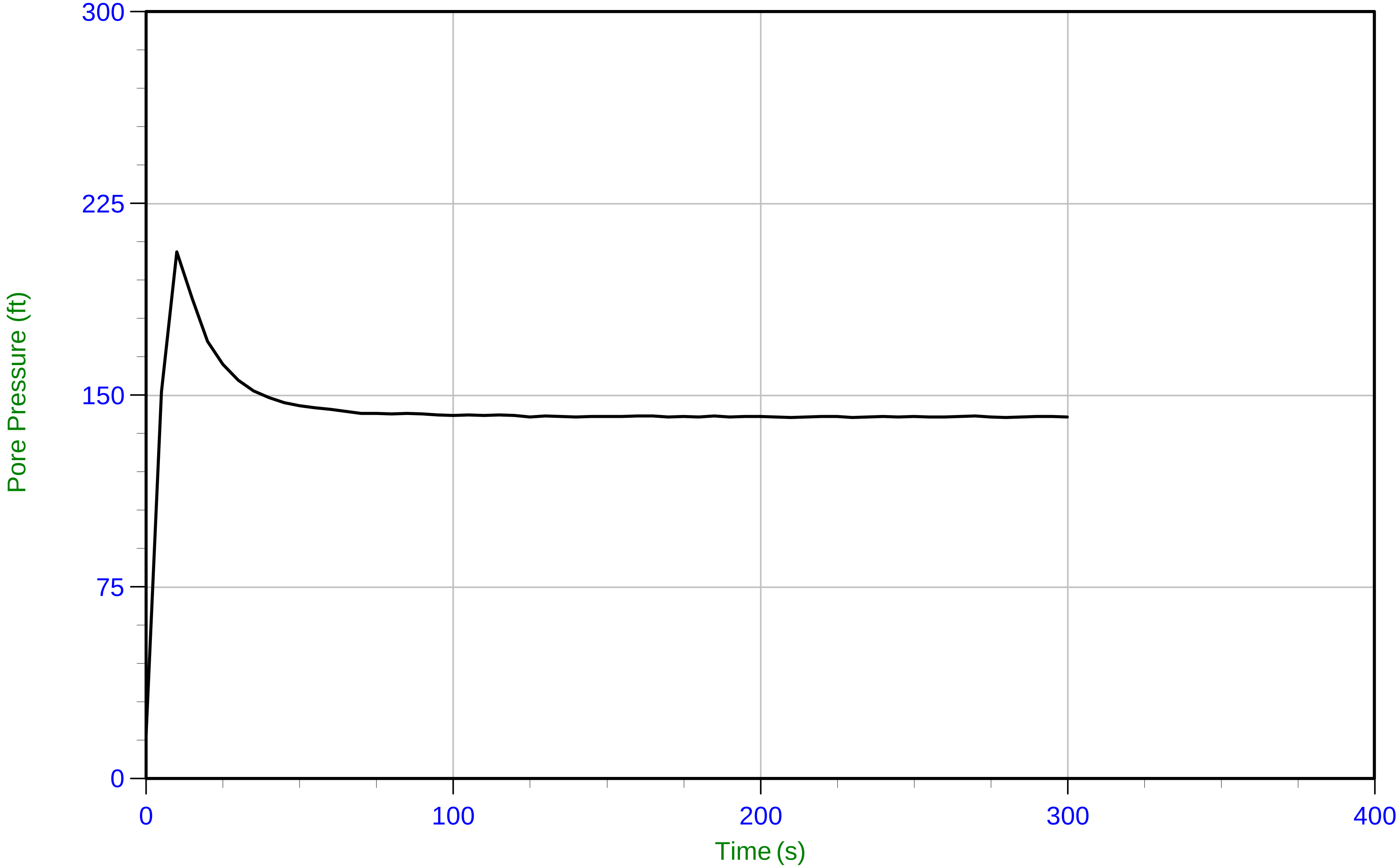
U Min: -0.9 ft
U Max: 187.3 ft

WT: -14.080 m / -46.194 ft
Ueq: 133.1 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP27.PPF
Depth: 28.725 m / 94.241 ft
Duration: 300.0 s

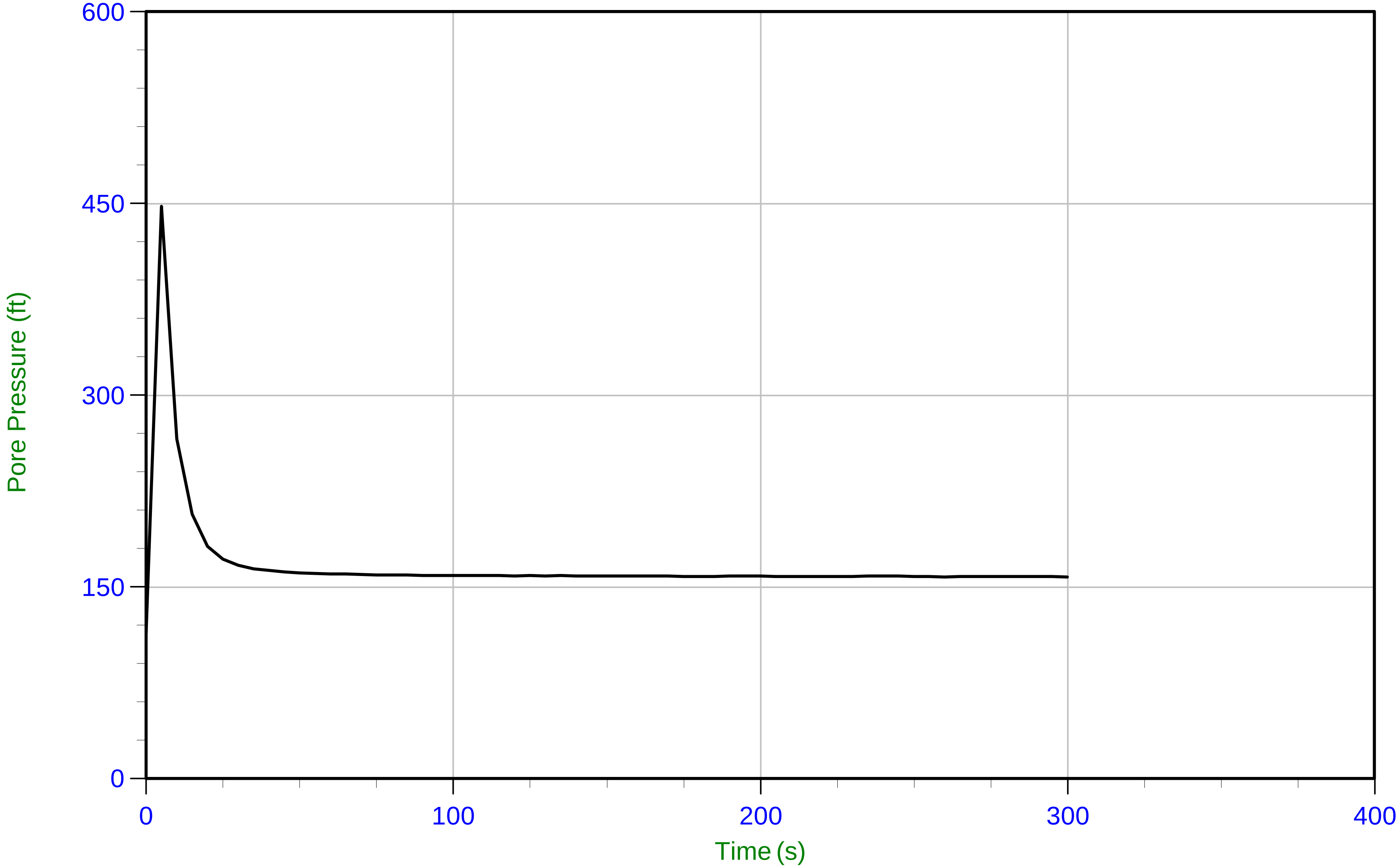
U Min: 17.0 ft
U Max: 206.1 ft

WT: -14.317 m / -46.971 ft
Ueq: 141.2 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K Area=15 cm²



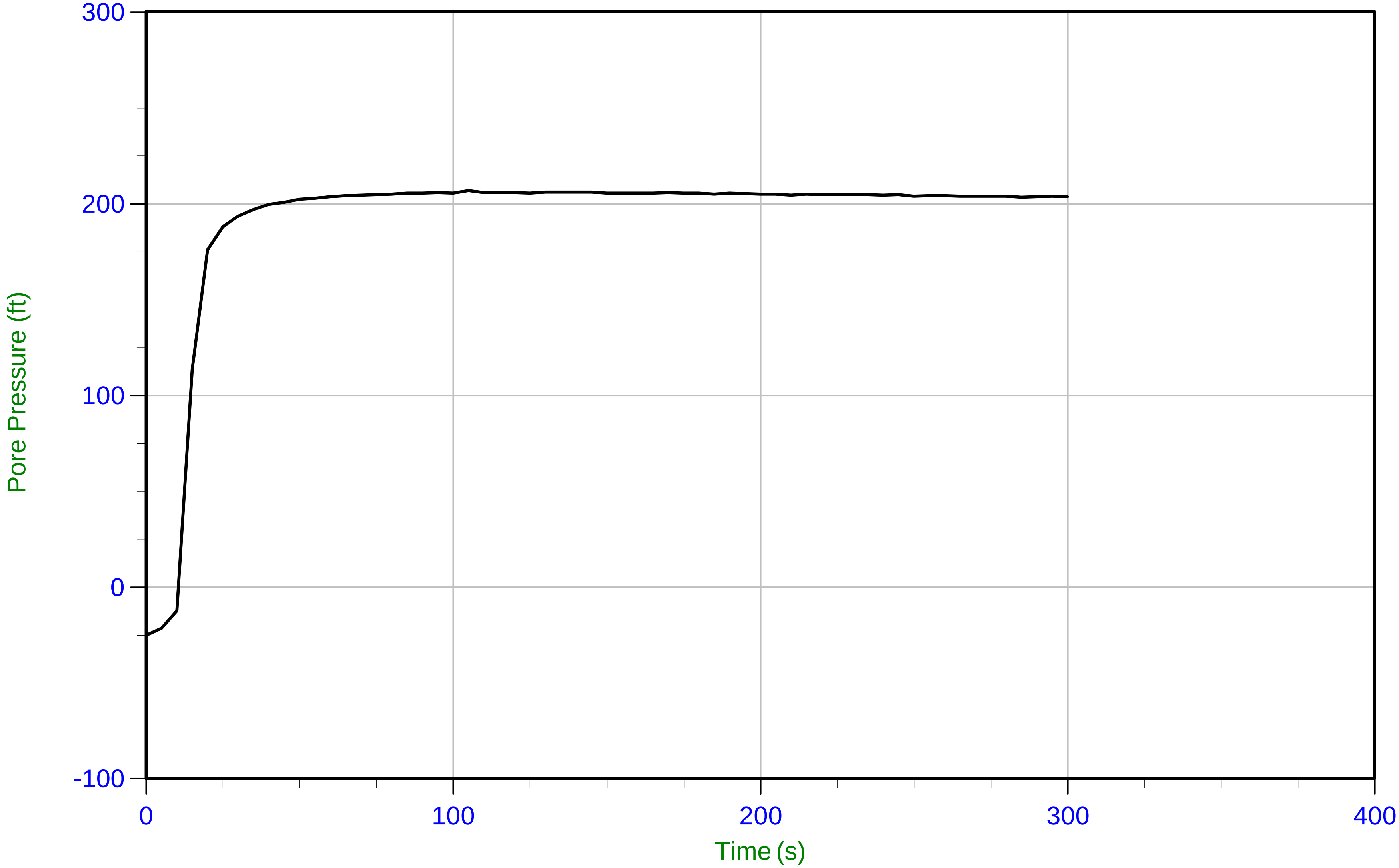
Trace Summary:

Filename: 17-51001_SP27.PPF
Depth: 32.500 m / 106.626 ft
Duration: 300.0 s

U Min: 114.0 ft
U Max: 447.7 ft

WT: -15.707 m / -51.532 ft
Ueq: 158.2 ft

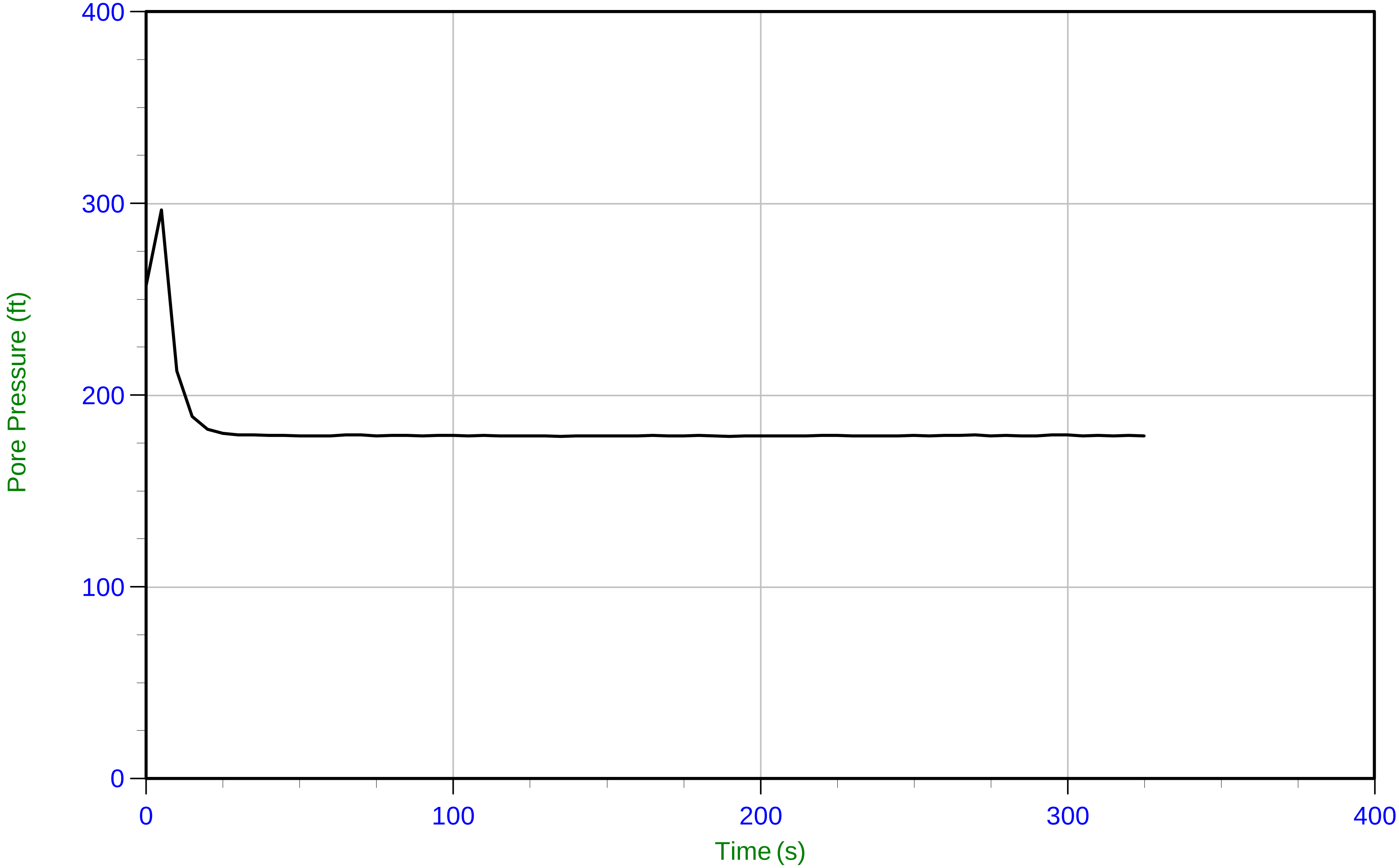
Fairbanks Gold Mining	Job No: 17-51001 Date: 03/07/2017 04:21 Site: Fort Knox TSF	Sounding: SCPT17-27 Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP27.PPF	U Min: -25.2 ft	WT: -24.353 m / -79.897 ft
Depth: 37.500 m / 123.030 ft	U Max: 206.7 ft	Ueq: 202.9 ft
Duration: 300.0 s		

Fairbanks Gold Mining	Job No: 17-51001 Date: 03/07/2017 04:21 Site: Fort Knox TSF	Sounding: SCPT17-27 Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

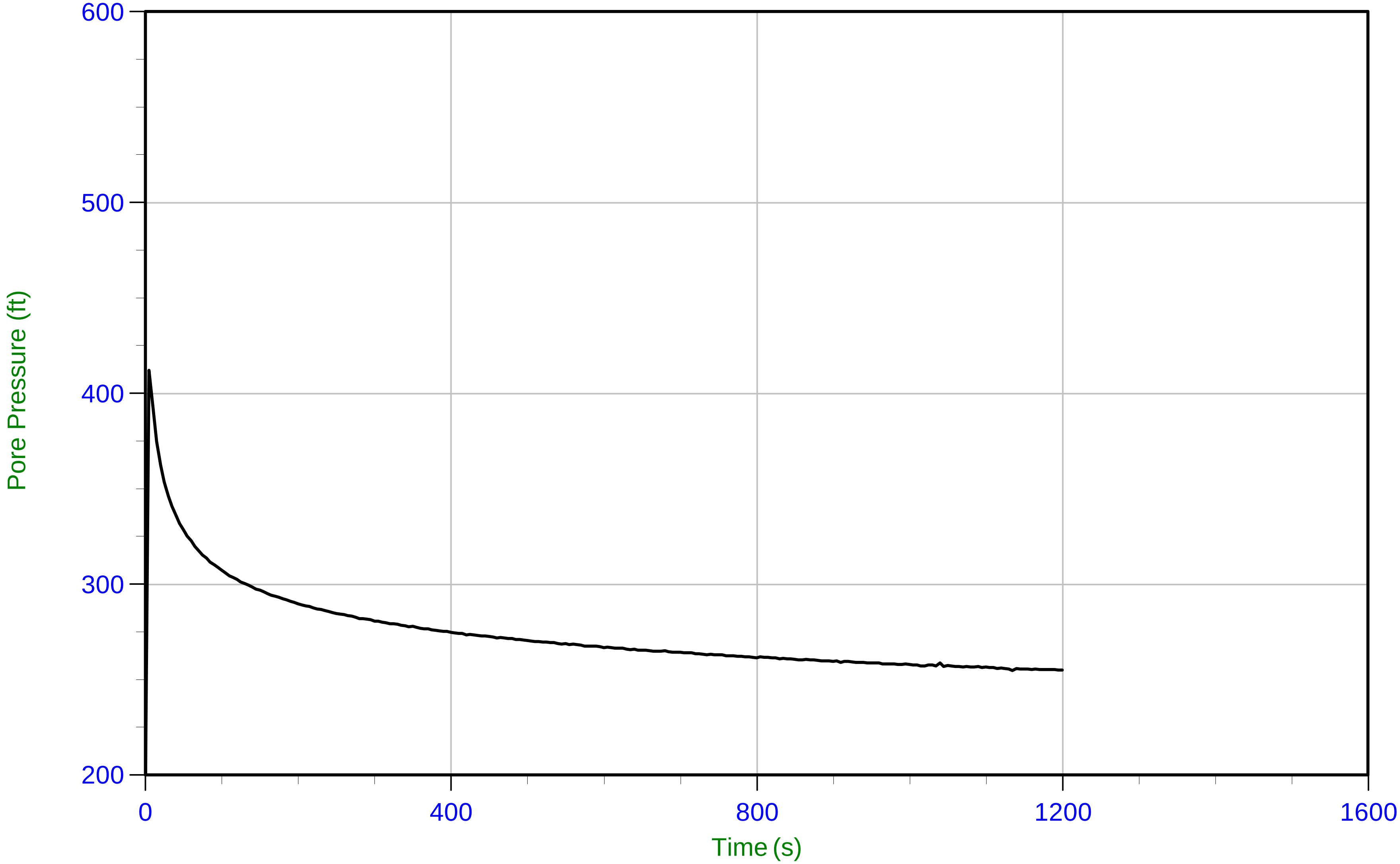
Filename: 17-51001_SP27.PPF	U Min: 178.7 ft	WT: -13.603 m / -44.629 ft
Depth: 40.725 m / 133.611 ft	U Max: 296.8 ft	Ueq: 178.2 ft
Duration: 325.0 s		

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/07/2017 04:21
Site: Fort Knox TSF

Sounding: SCPT17-27
Cone: 473:T1500F15U1K Area=15 cm²

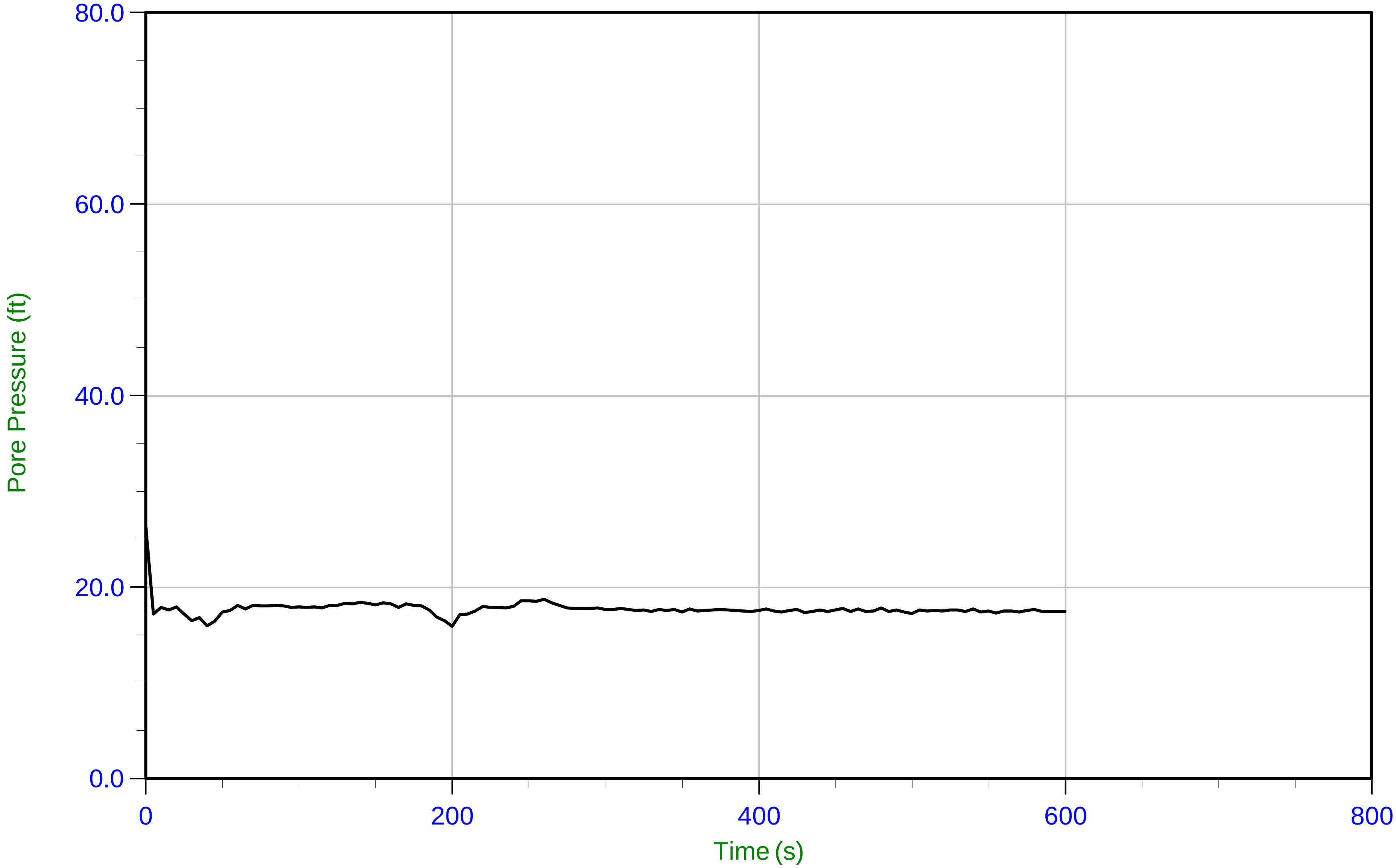


Trace Summary:

Filename: 17-51001_SP27.PPF
Depth: 44.850 m / 147.144 ft
Duration: 1200.0 s

U Min: 176.2 ft
U Max: 412.2 ft

Fairbanks Gold Mining	Job No: 17-51001 Date: 03/06/2017 00:51 Site: Fort Knox TSF	Sounding: SCPT17-28 Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

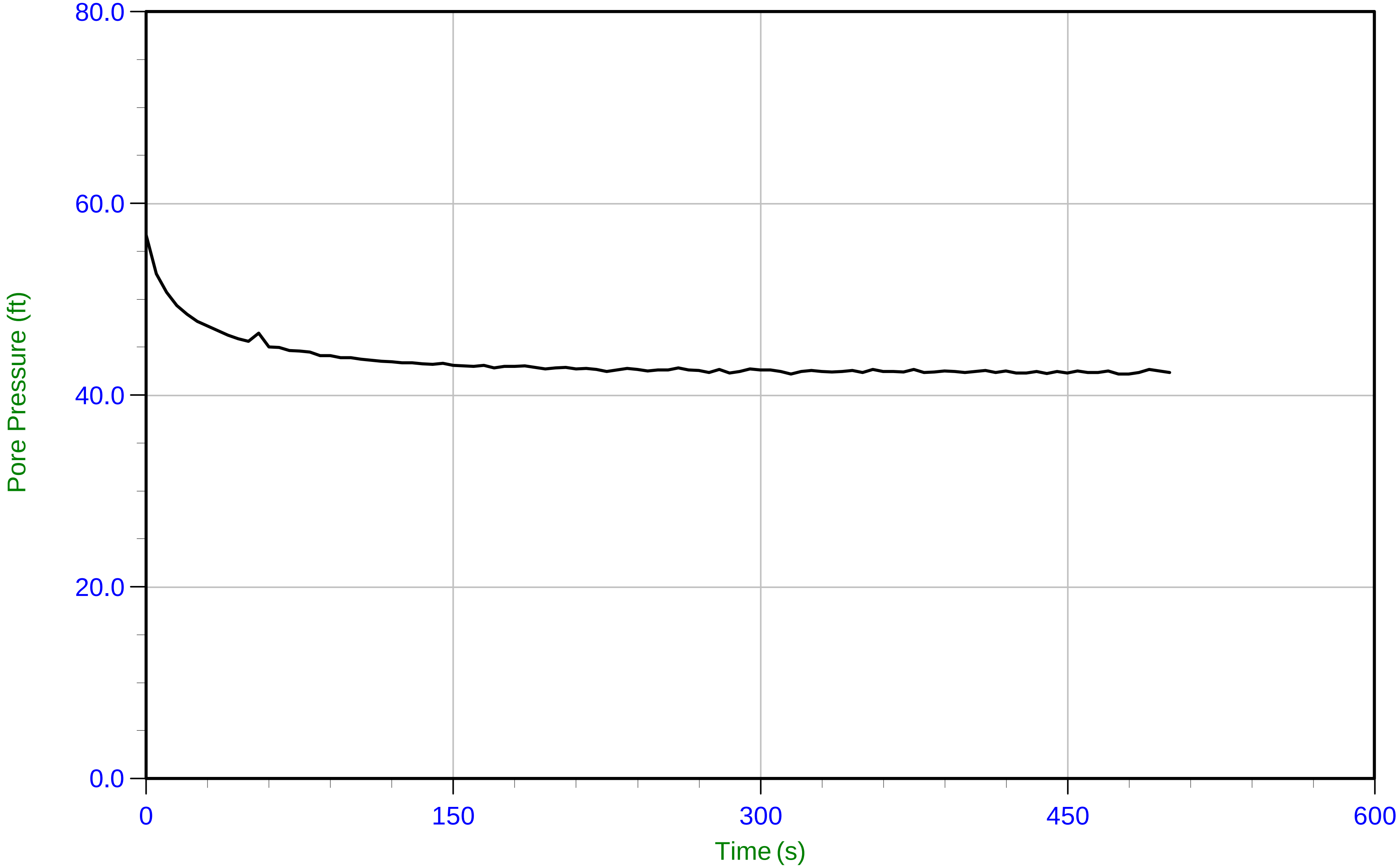
Filename: 17-51001_SP28.PPF	U Min: 15.9 ft	WT: 0.570 m / 1.870 ft
Depth: 5.875 m / 19.275 ft	U Max: 26.4 ft	Ueq: 17.4 ft
Duration: 600.0 s		

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 10.925 m / 35.843 ft
Duration: 500.0 s

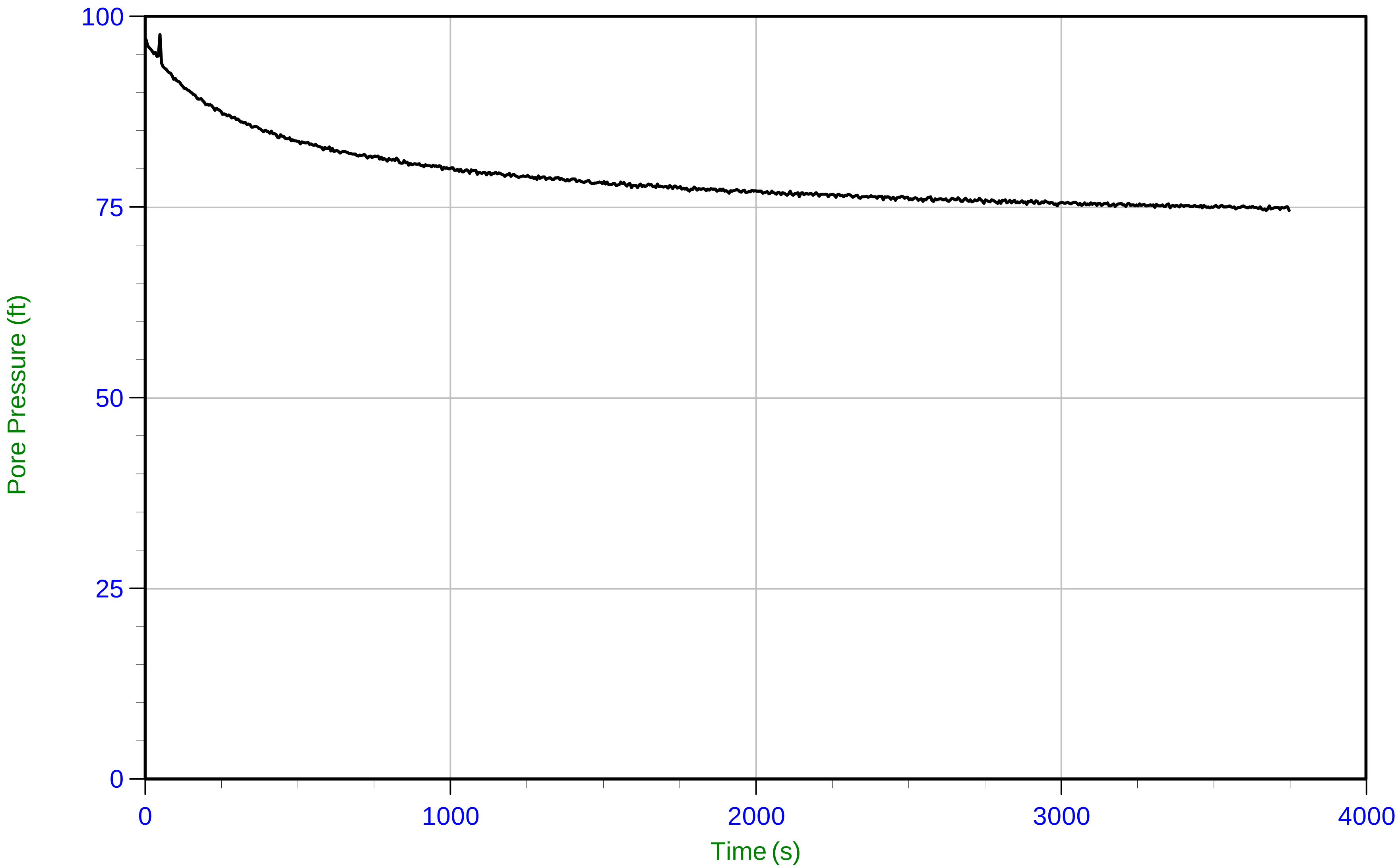
U Min: 42.2 ft
U Max: 56.7 ft

WT: -1.981 m / -6.499 ft
Ueq: 42.3 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 15.925 m / 52.247 ft
Duration: 3750.0 s

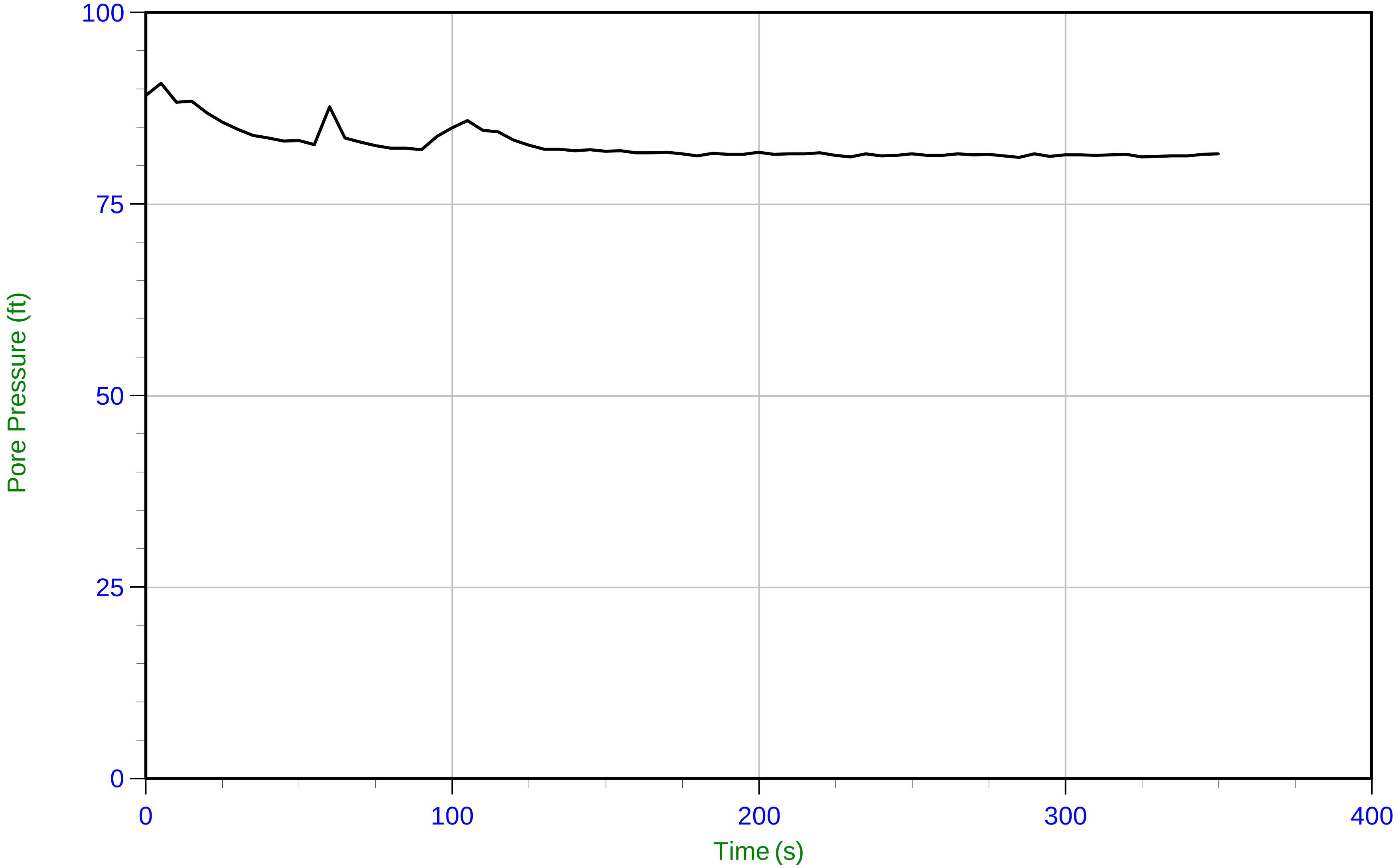
U Min: 74.6 ft
U Max: 97.6 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 19.875 m / 65.206 ft
Duration: 350.0 s

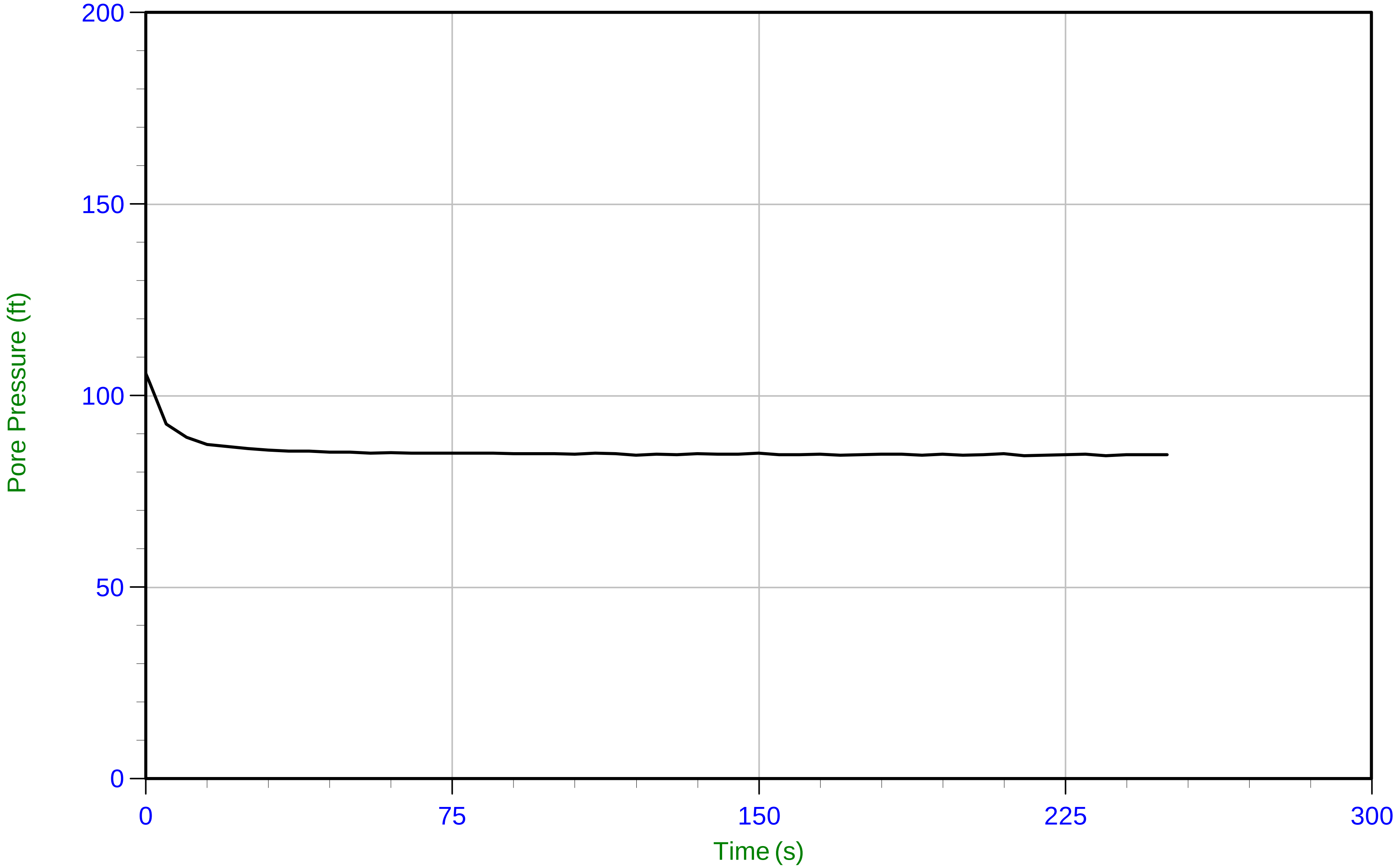
U Min: 81.1 ft
U Max: 90.8 ft

WT: -4.930 m / -16.174 ft
Ueq: 81.4 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 20.850 m / 68.405 ft
Duration: 250.0 s

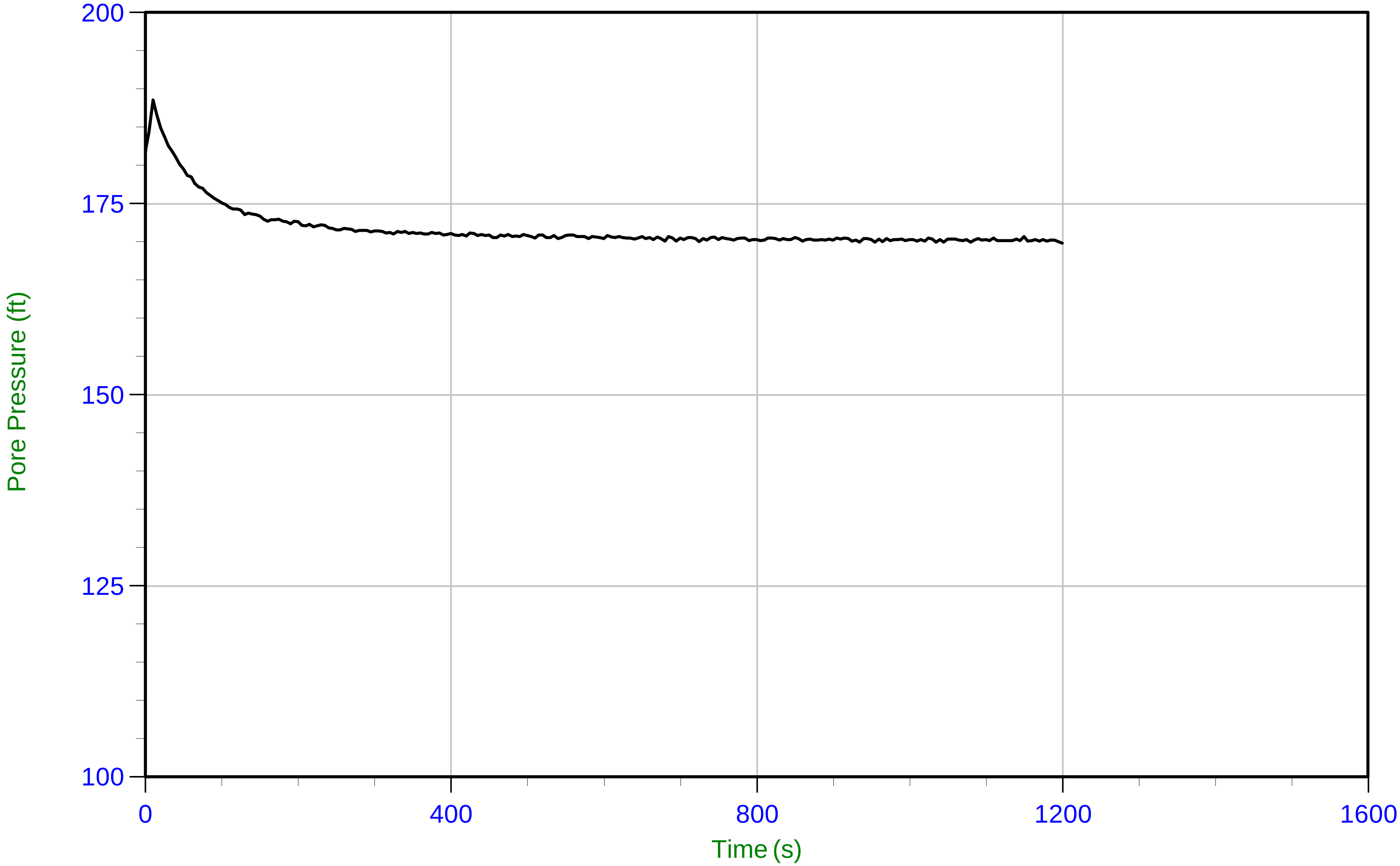
U Min: 84.4 ft
U Max: 105.9 ft

WT: -4.911 m / -16.112 ft
Ueq: 84.5 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 34.850 m / 114.336 ft
Duration: 1200.0 s

U Min: 169.8 ft
U Max: 188.6 ft

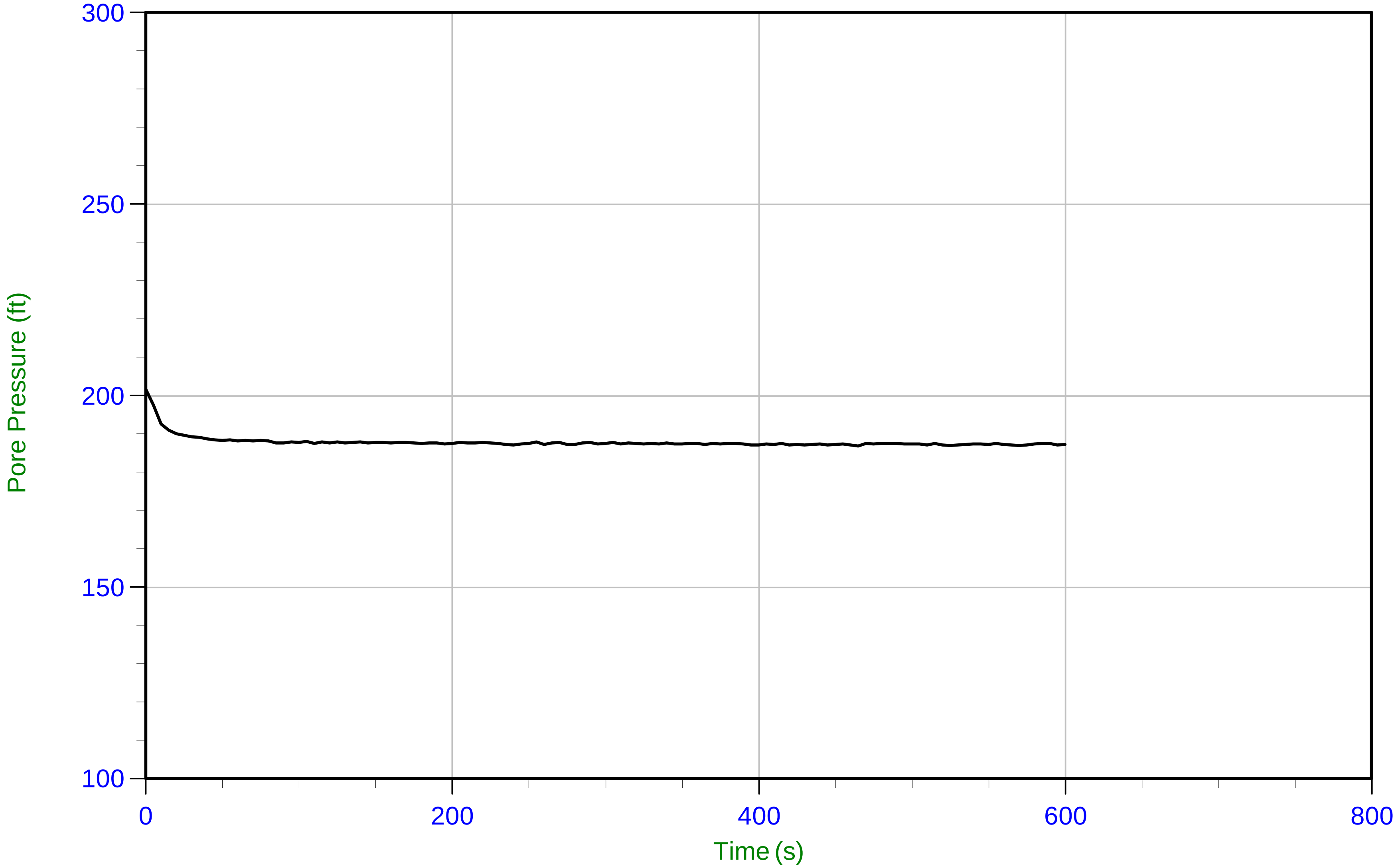
WT: -16.992 m / -55.747 ft
Ueq: 170.1 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 42.600 m / 139.762 ft
Duration: 600.0 s

U Min: 186.9 ft
U Max: 201.6 ft

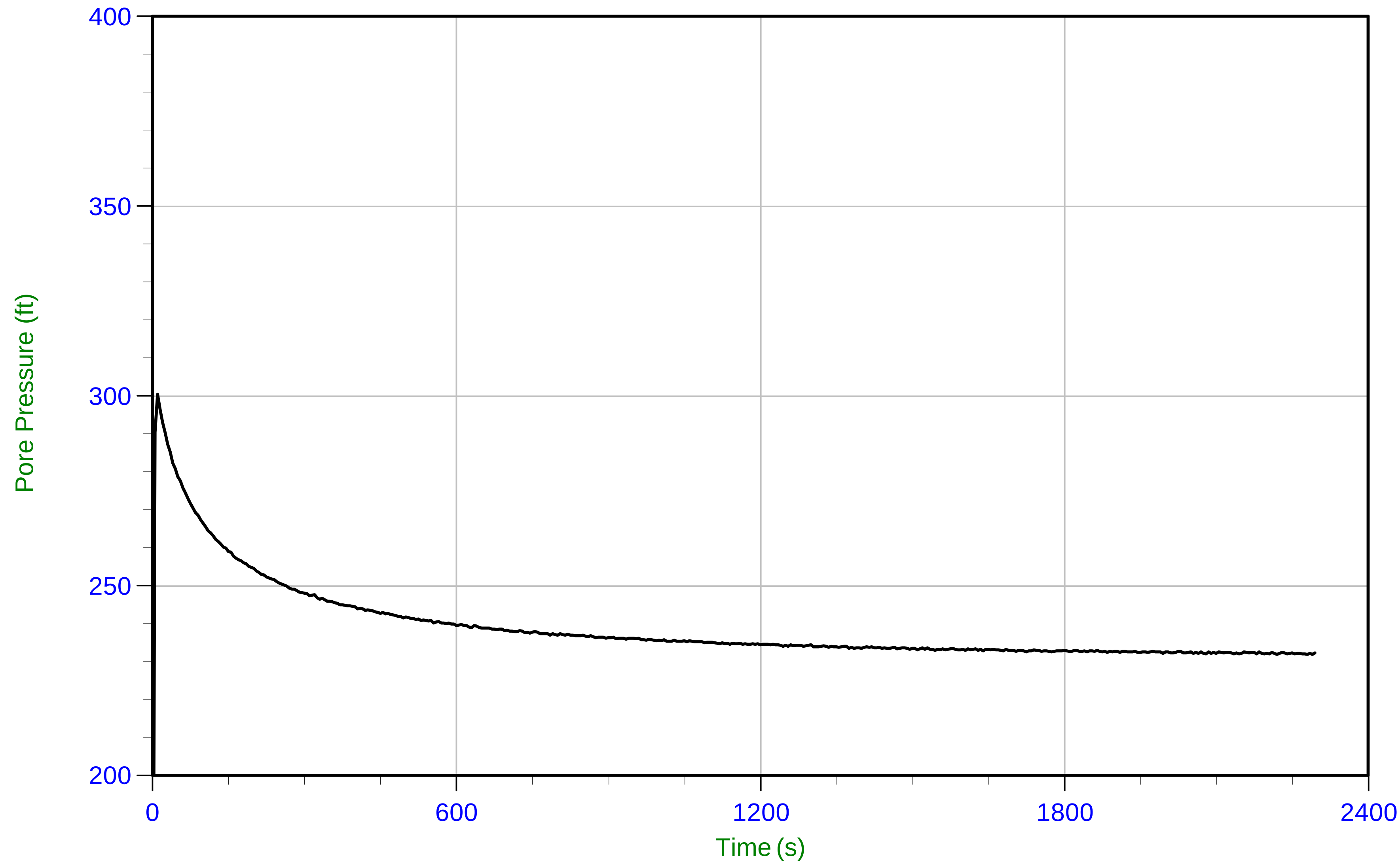
WT: -14.407 m / -47.266 ft
Ueq: 187.0 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 52.400 m / 171.914 ft
Duration: 2295.0 s

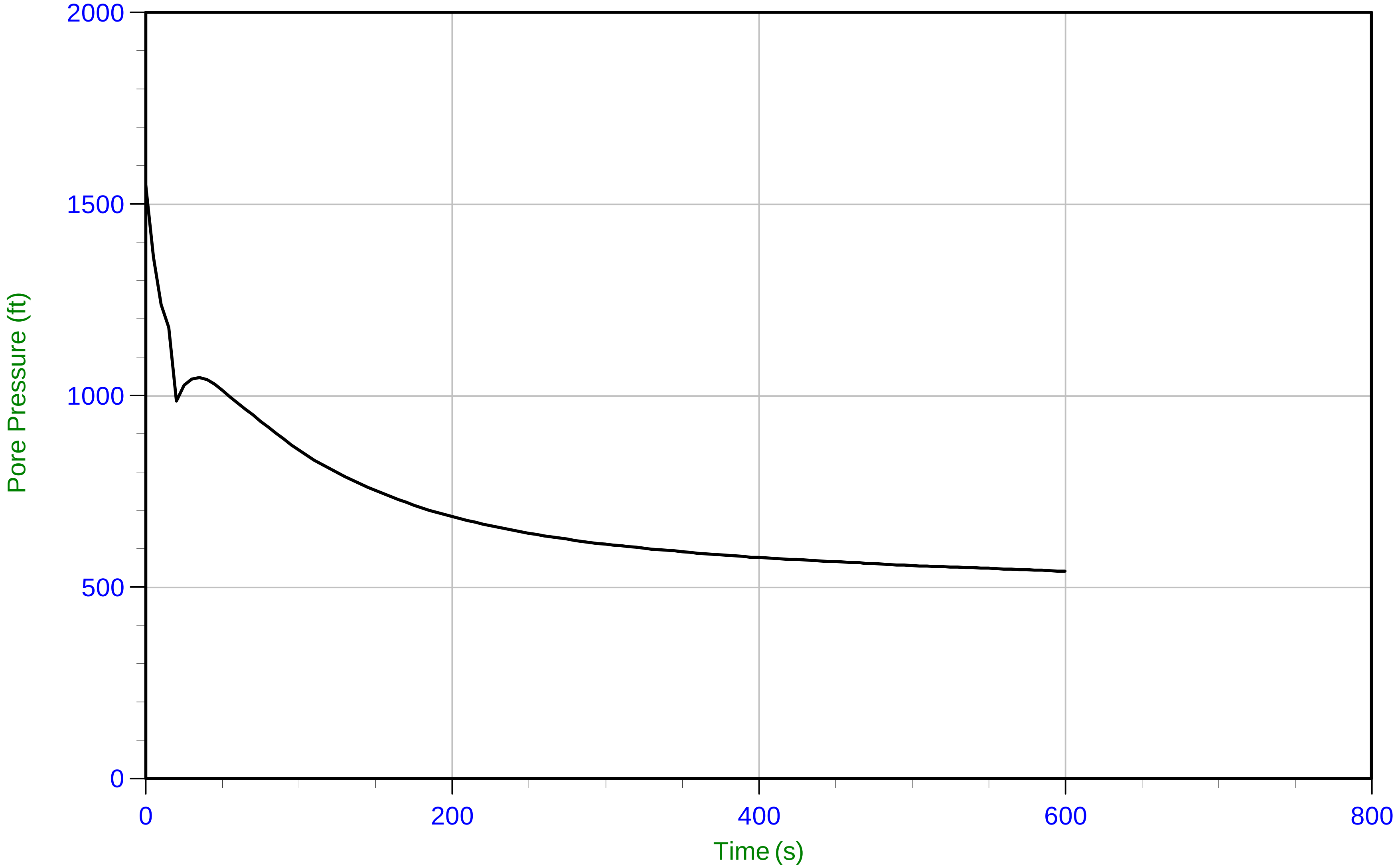
U Min: 91.9 ft
U Max: 300.4 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

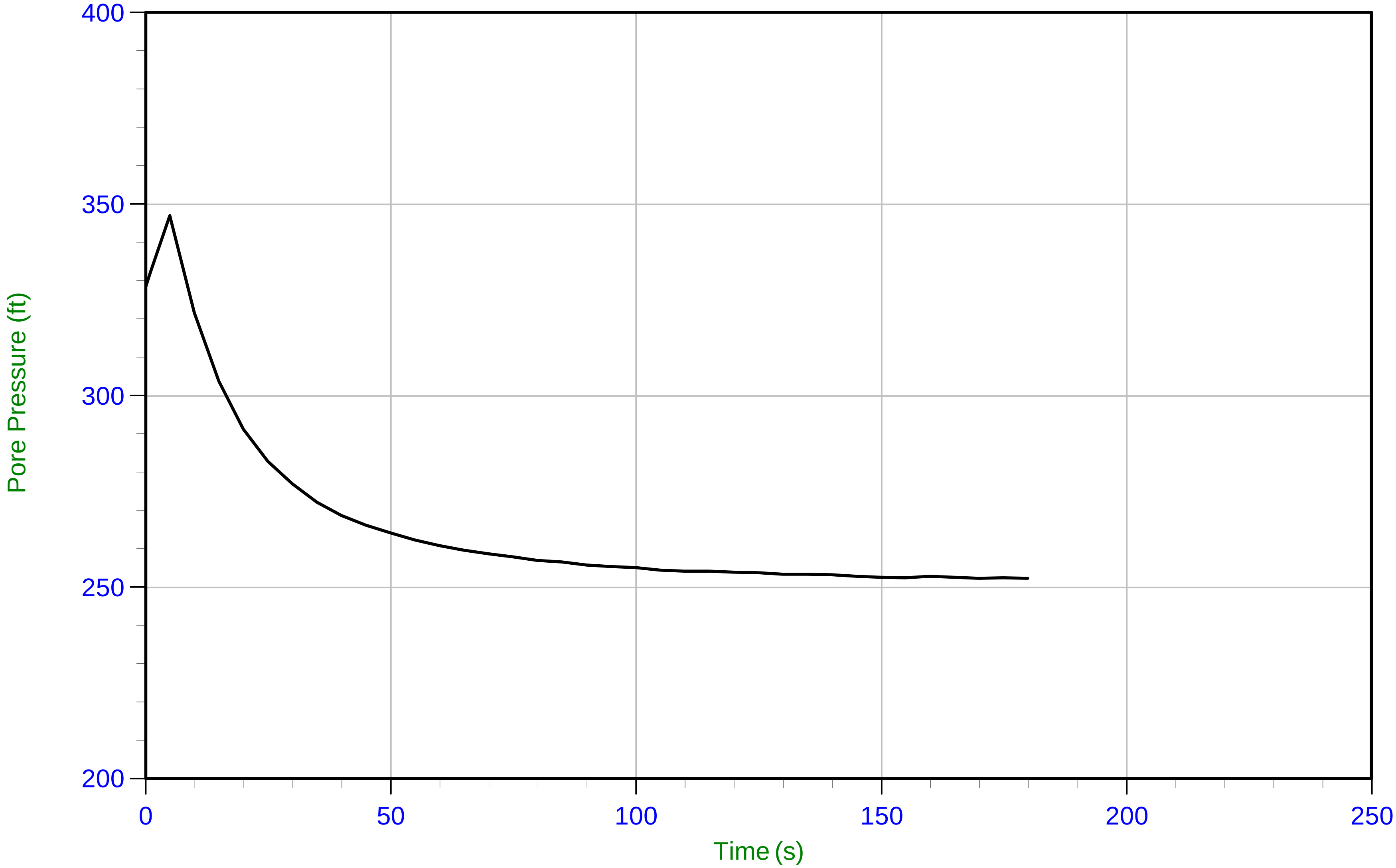
Filename: 17-51001_SP28.PPF
Depth: 58.225 m / 191.025 ft
Duration: 600.0 s

U Min: 541.8 ft
U Max: 1549.0 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 63.525 m / 208.413 ft
Duration: 180.0 s

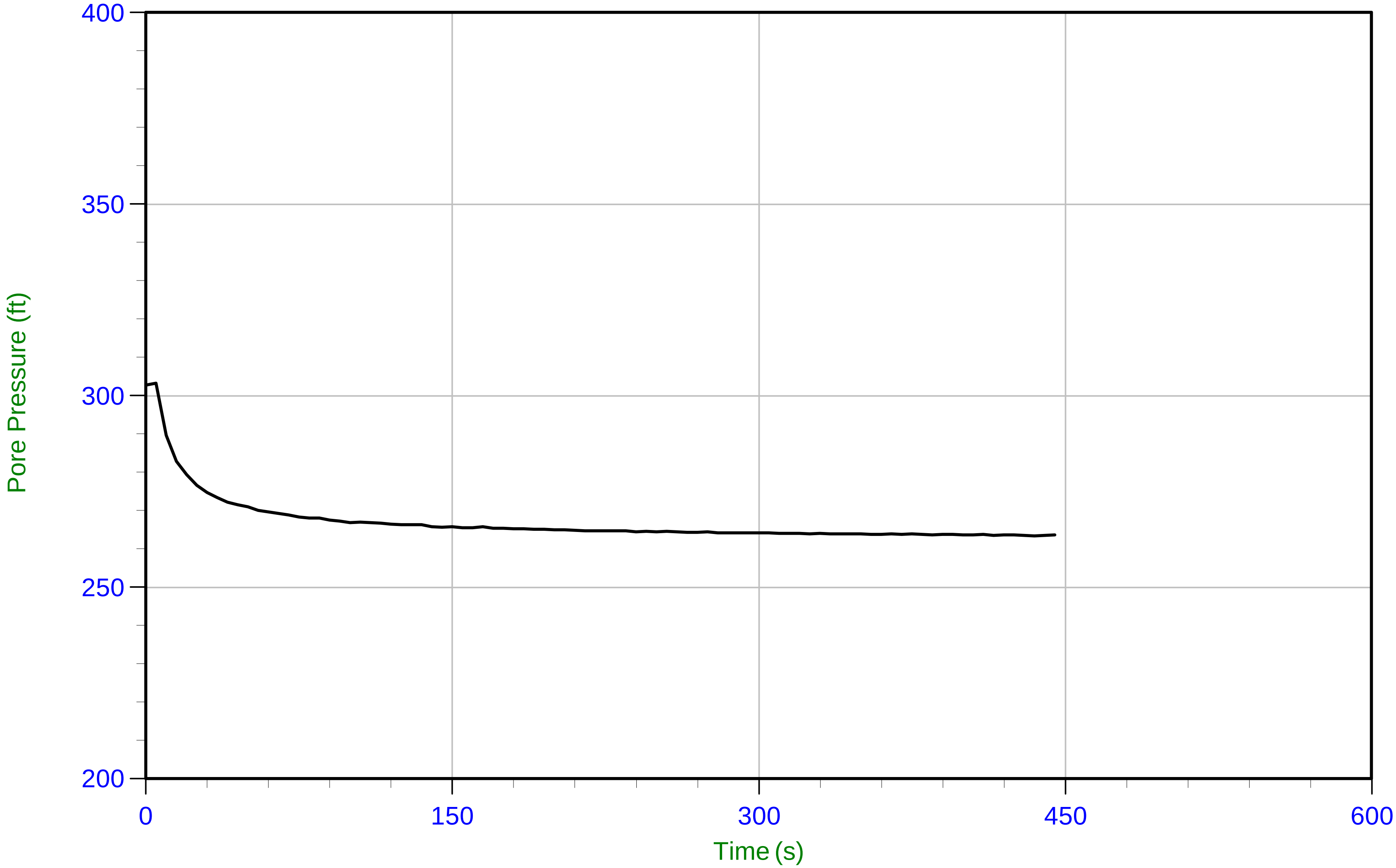
U Min: 252.3 ft
U Max: 347.1 ft

WT: -13.376 m / -43.884 ft
Ueq: 252.3 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 66.875 m / 219.404 ft
Duration: 445.0 s

U Min: 263.4 ft
U Max: 303.2 ft

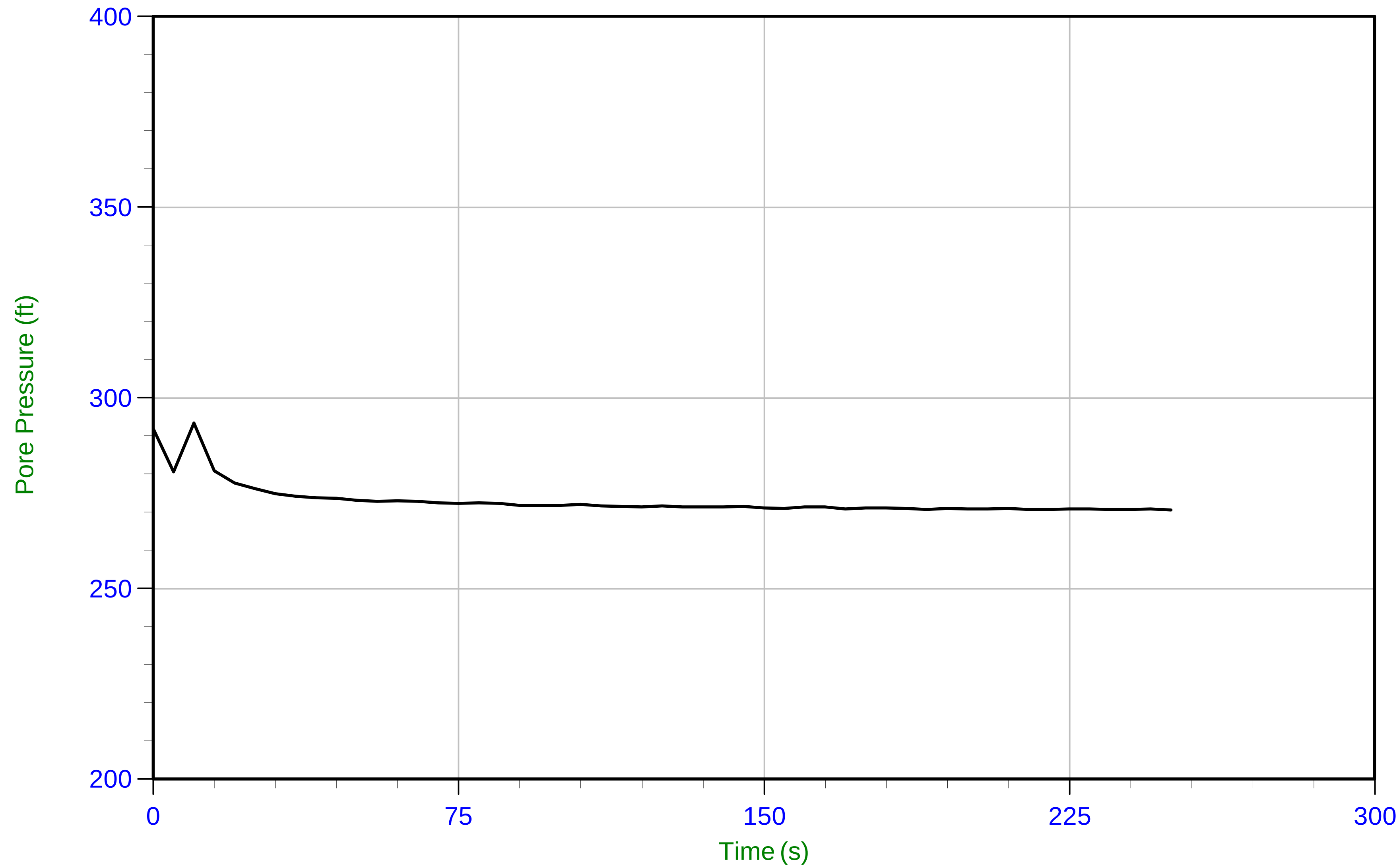
WT: -13.409 m / -43.992 ft
Ueq: 263.4 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 69.150 m / 226.867 ft
Duration: 250.0 s

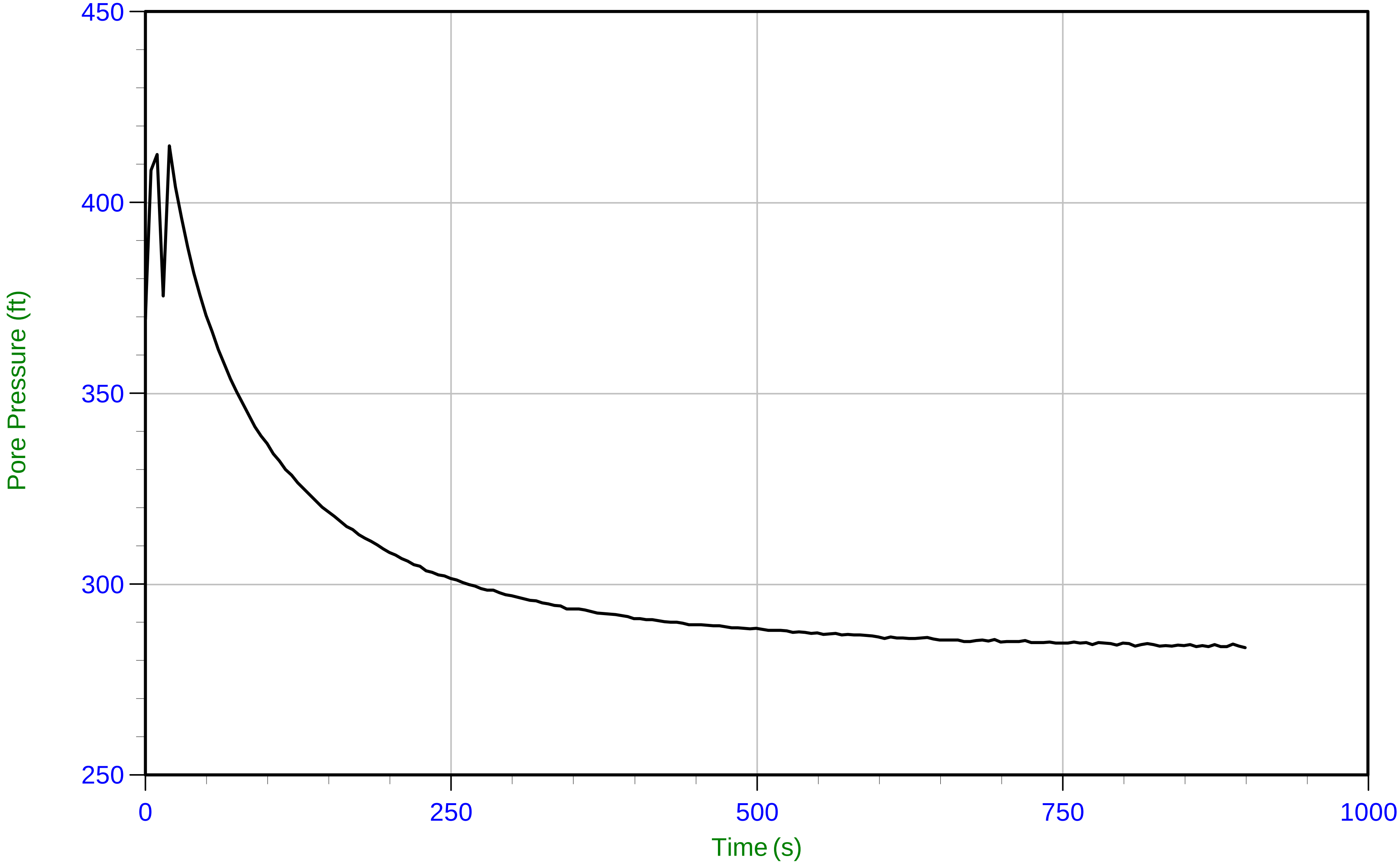
U Min: 270.6 ft
U Max: 293.3 ft

WT: -13.363 m / -43.841 ft
Ueq: 270.7 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/06/2017 00:51
Site: Fort Knox TSF

Sounding: SCPT17-28
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP28.PPF
Depth: 76.400 m / 250.653 ft
Duration: 900.0 s

U Min: 283.5 ft
U Max: 414.8 ft

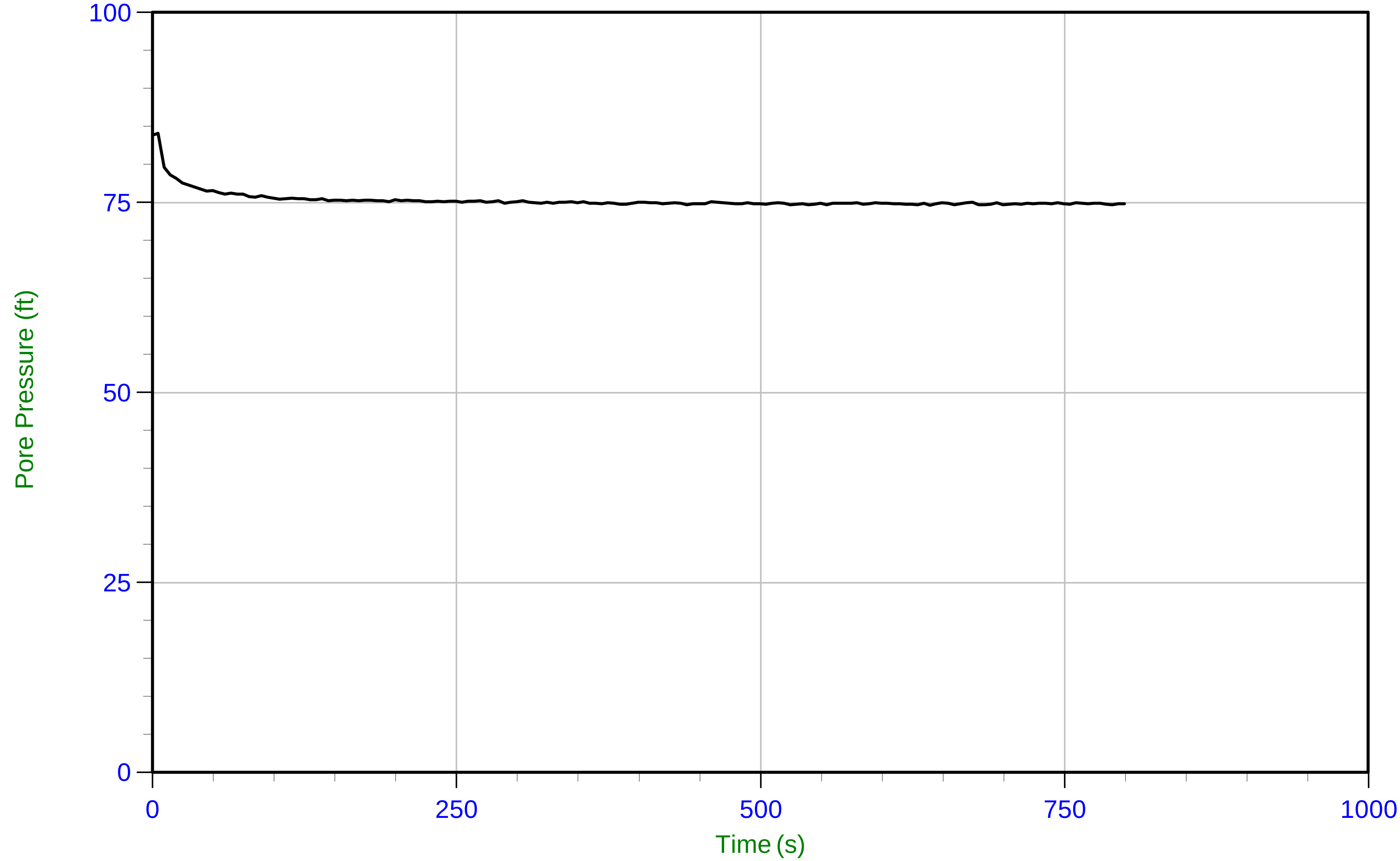
WT: -10.003 m / -32.818 ft
Ueq: 283.5 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/04/2017 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP29.PPF
Depth: 17.900 m / 58.726 ft
Duration: 800.0 s

U Min: 74.6 ft
U Max: 84.1 ft

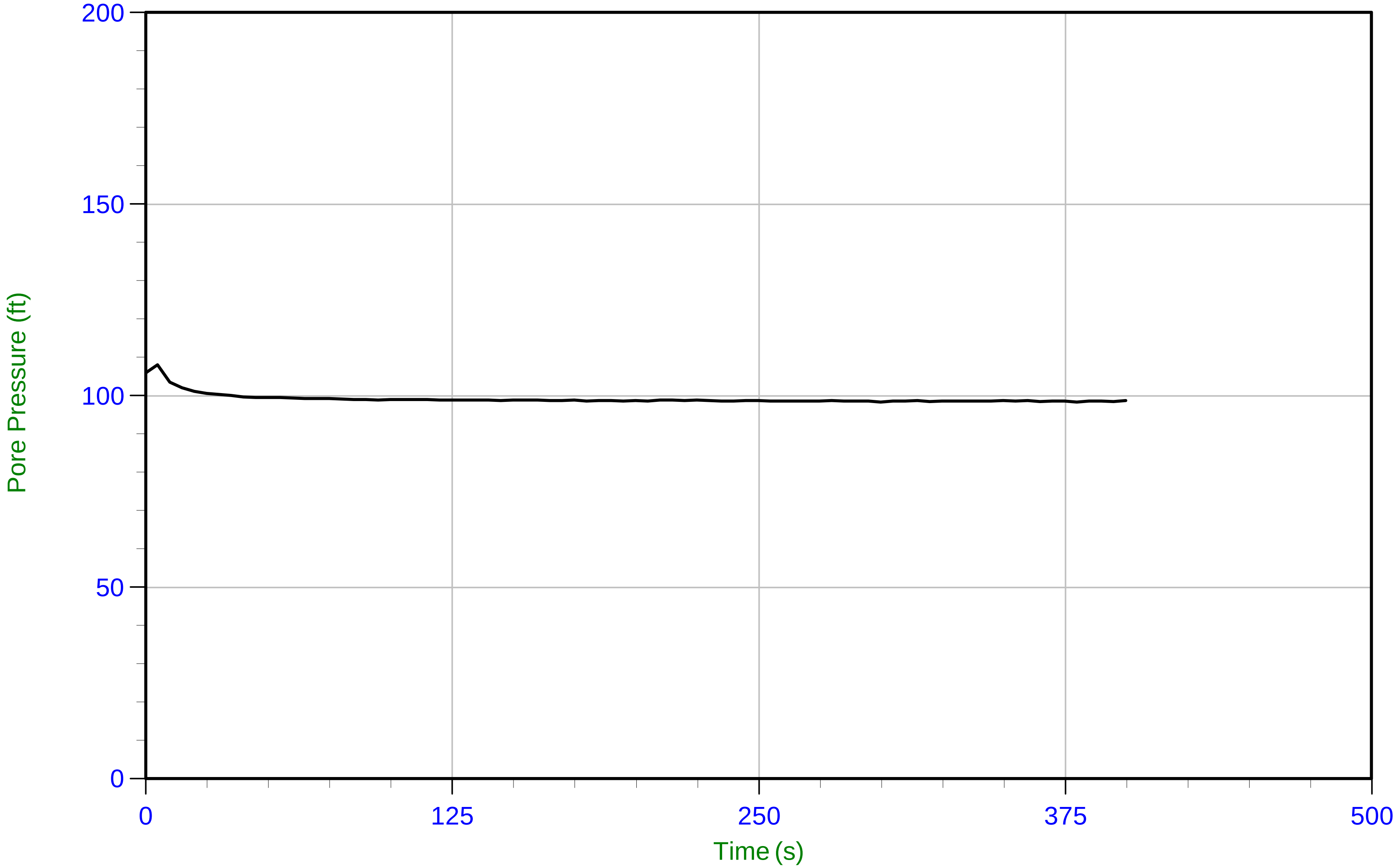
WT: -4.928 m / -16.168 ft
Ueq: 74.9 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/04/2017 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K Area=15 cm²



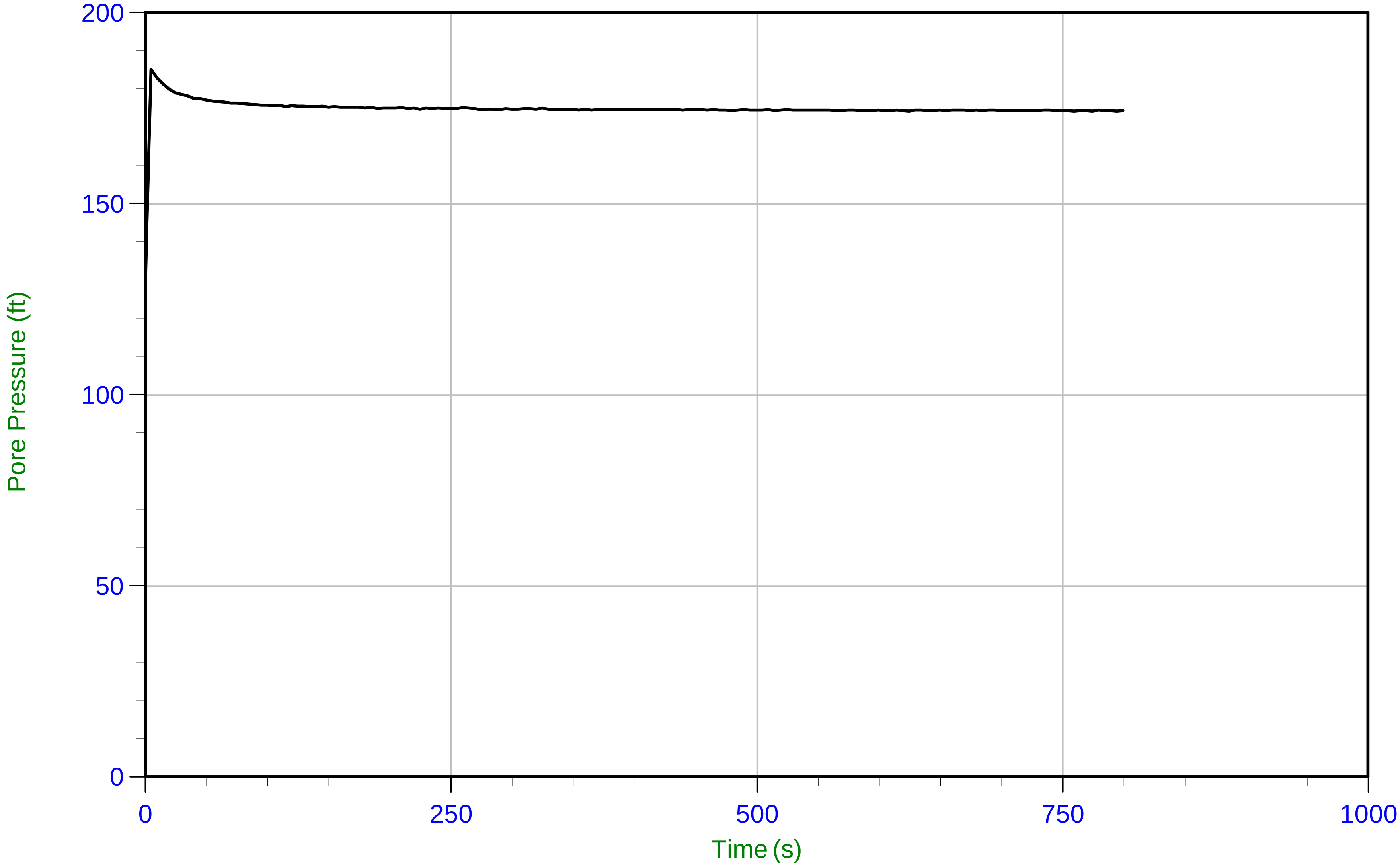
Trace Summary:

Filename: 17-51001_SP29.PPF
Depth: 24.425 m / 80.134 ft
Duration: 400.0 s

U Min: 98.4 ft
U Max: 108.0 ft

WT: -5.672 m / -18.609 ft
Ueq: 98.7 ft

Fairbanks Gold Mining	Job No: 17-51001 Date: 03/04/2017 02:20 Site: Fort Knox TSF	Sounding: SCPT17-29 Cone: 473:T1500F15U1K Area=15 cm²



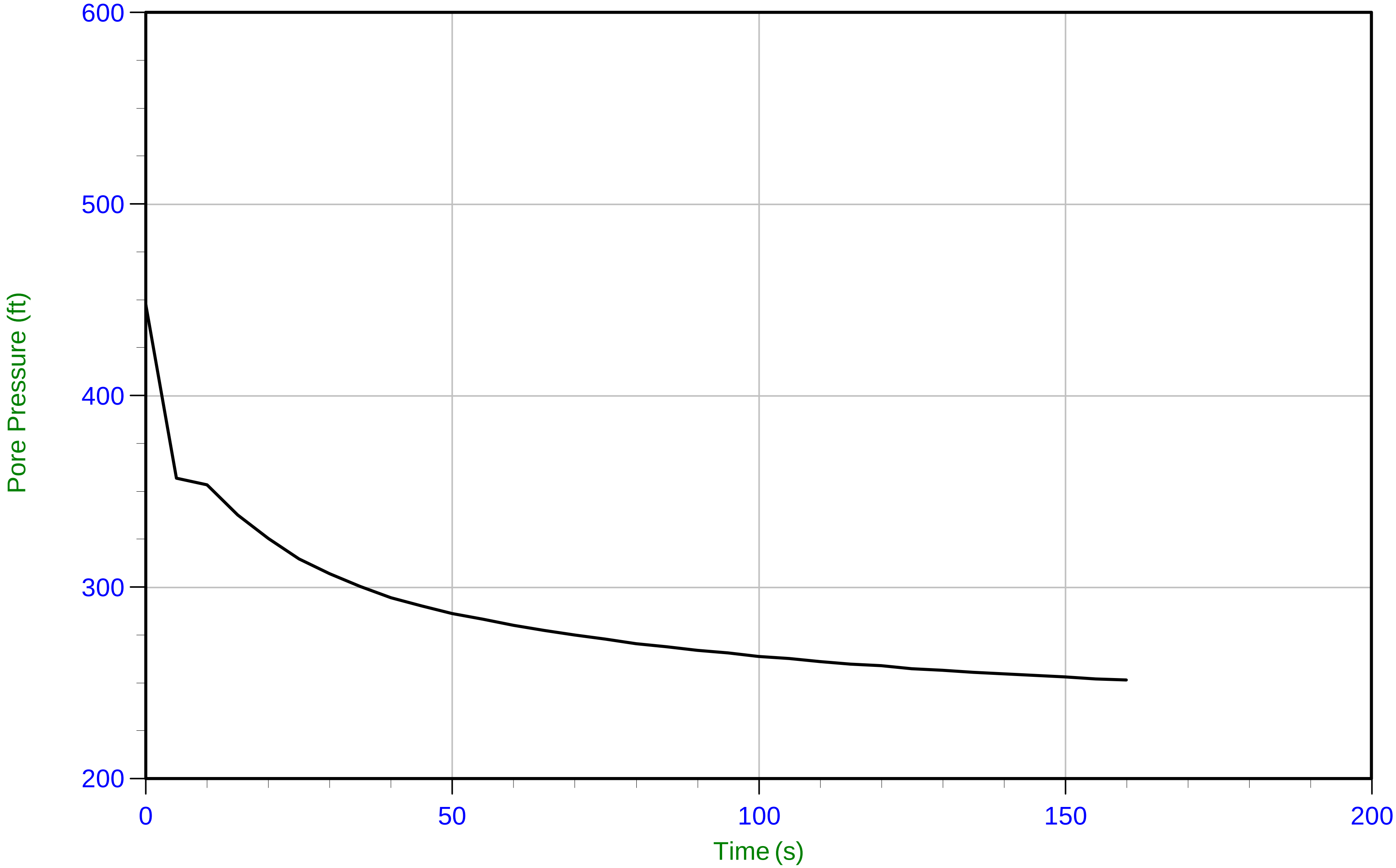
Trace Summary:

Filename: 17-51001_SP29.PPF	U Min: 128.9 ft	WT: -16.778 m / -55.045 ft
Depth: 36.275 m / 119.011 ft	U Max: 185.1 ft	Ueq: 174.1 ft
Duration: 800.0 s		

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/04/2017 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP29.PPF
Depth: 40.925 m / 134.267 ft
Duration: 160.0 s

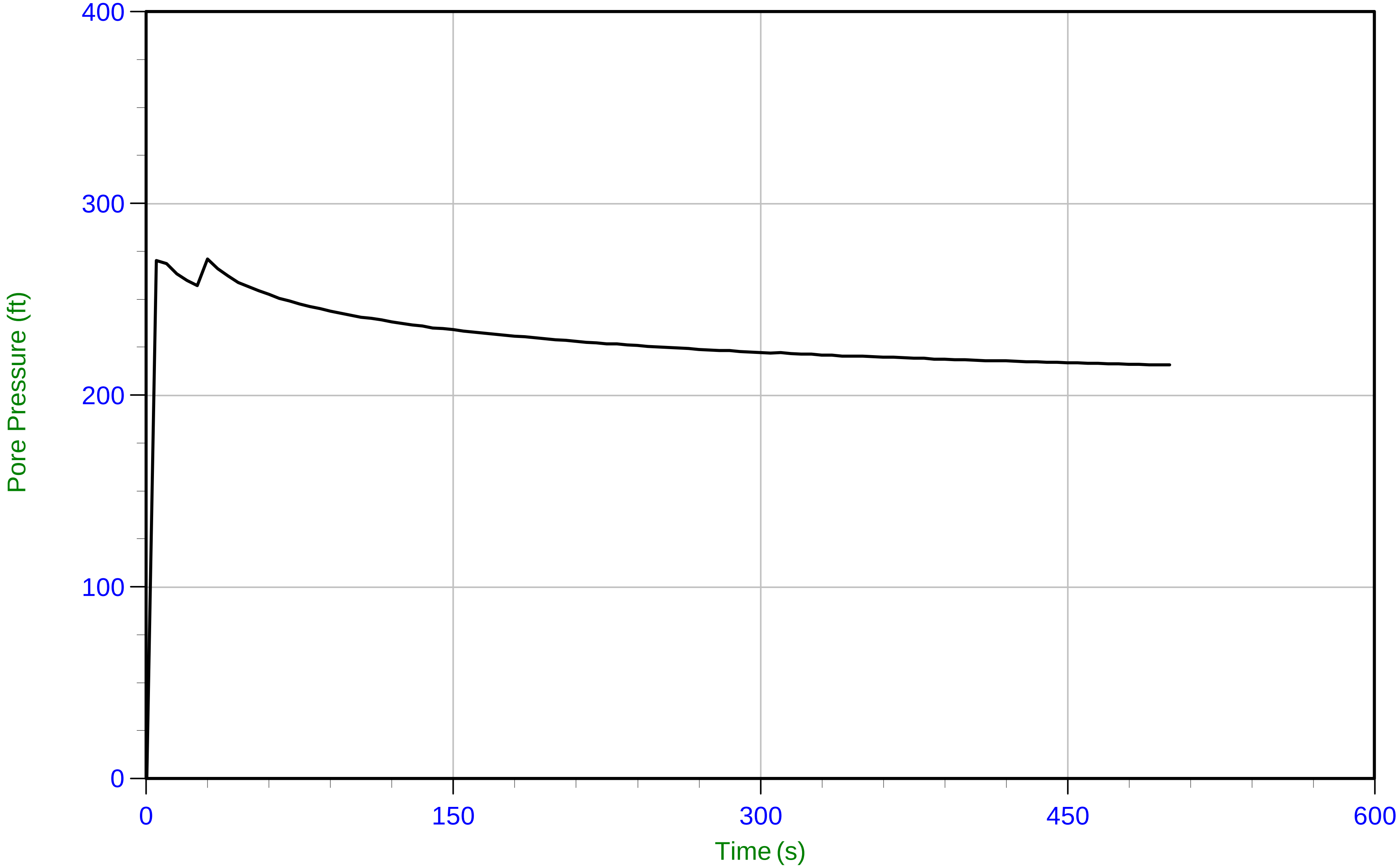
U Min: 251.5 ft
U Max: 447.7 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/04/2017 02:20
Site: Fort Knox TSF

Sounding: SCPT17-29
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

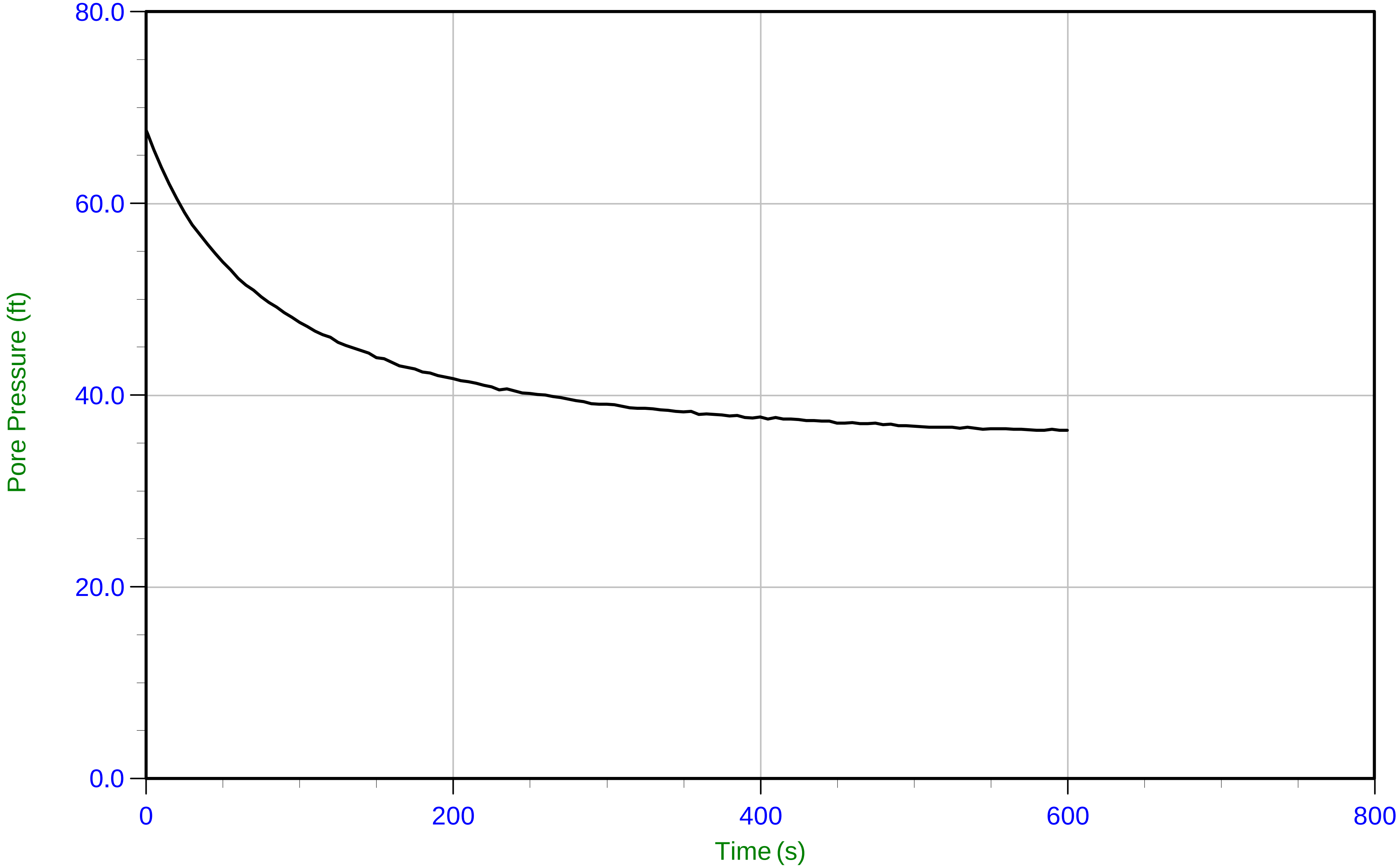
Filename: 17-51001_SP29.PPF
Depth: 49.075 m / 161.005 ft
Duration: 500.0 s

U Min: -20.4 ft
U Max: 271.0 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 02/28/2017 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP30.PPF
Depth: 9.825 m / 32.234 ft
Duration: 600.0 s

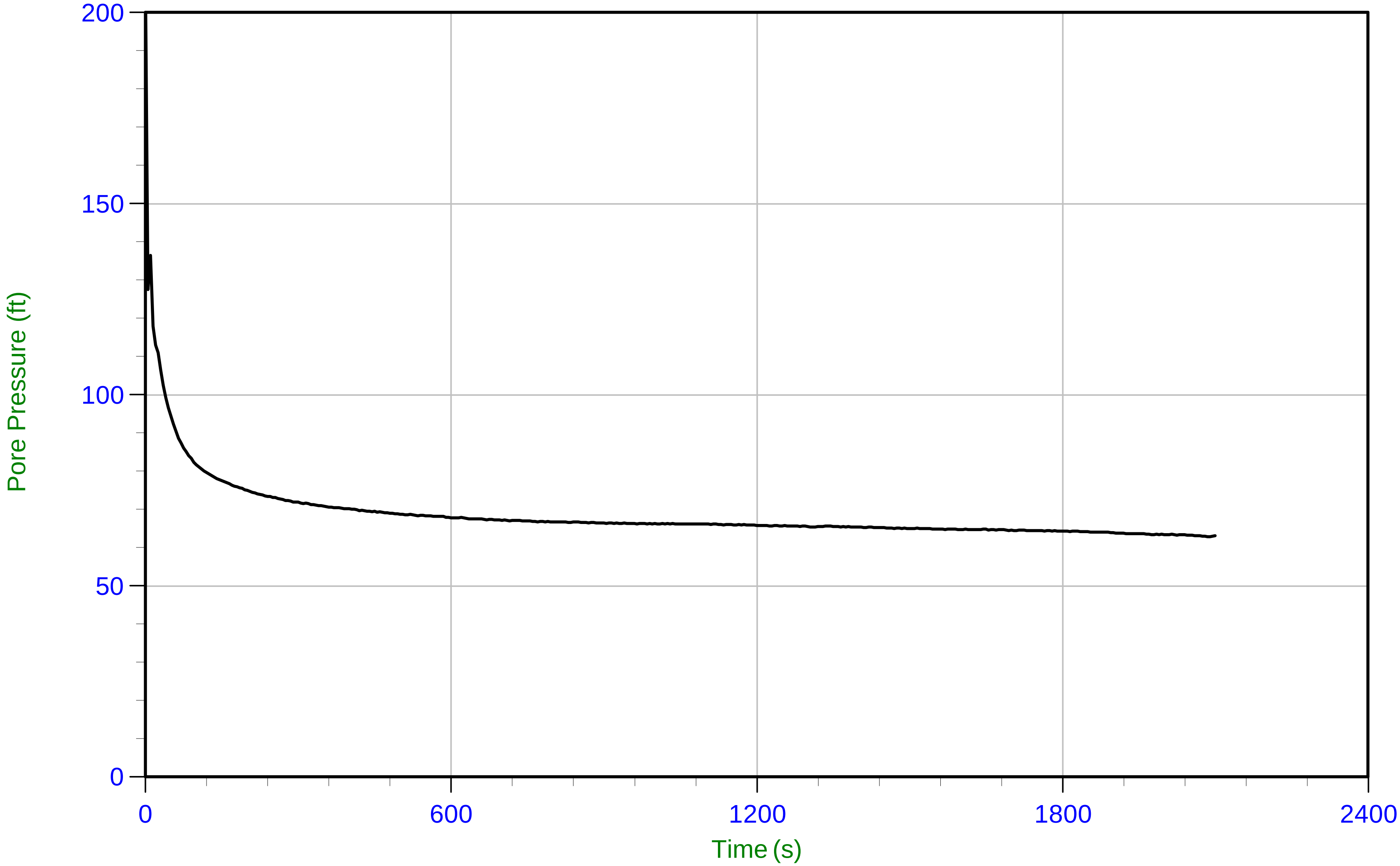
U Min: 36.3 ft
U Max: 67.7 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02/28/2017 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200 Area=15 cm²

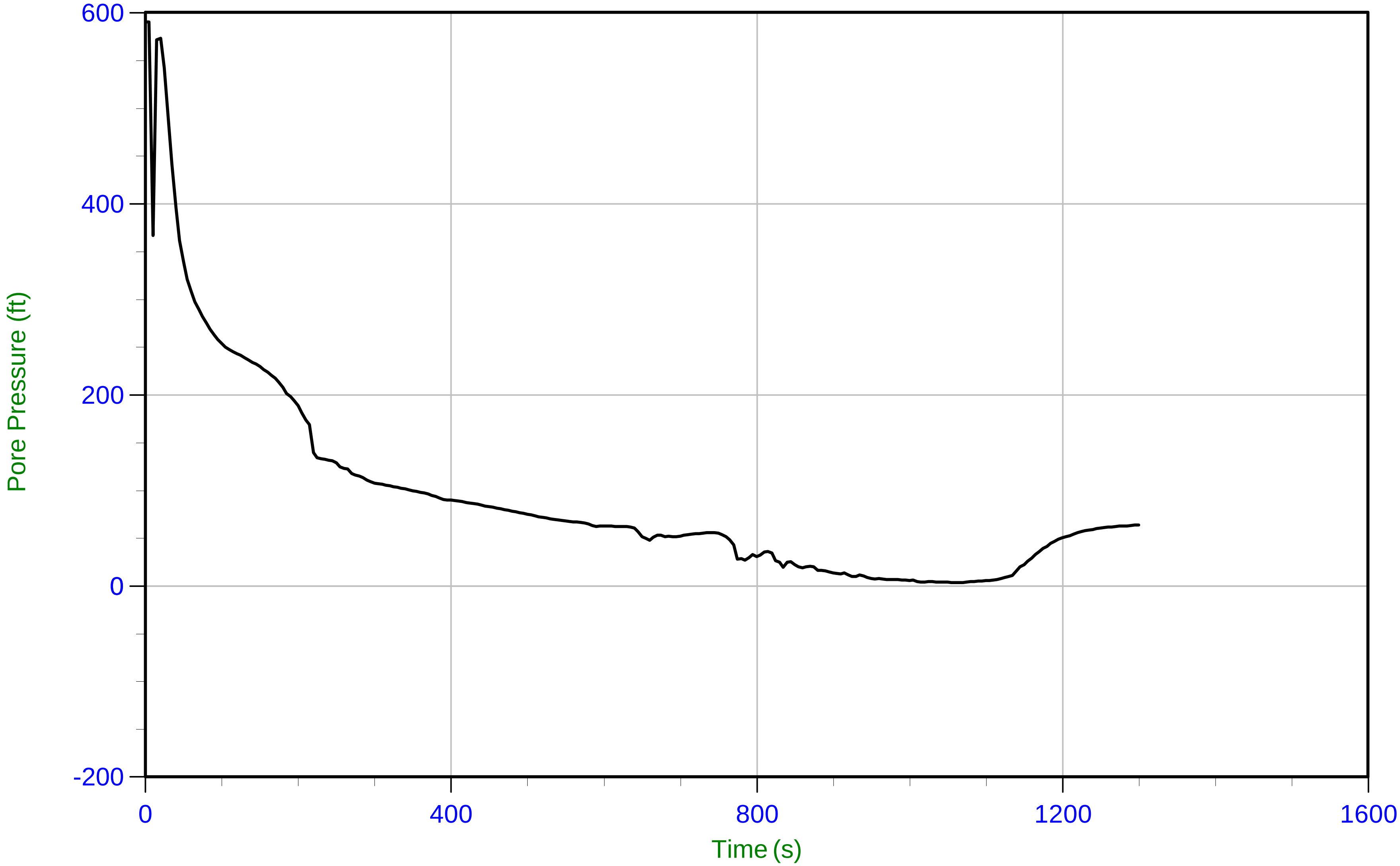


Trace Summary:

Filename: 17-51001_SP30.PPF
Depth: 13.000 m / 42.650 ft
Duration: 2100.0 s

U Min: 62.9 ft
U Max: 210.4 ft

Fairbanks Gold Mining	Job No: 17-51001 Date: 02/28/2017 23:06 Site: Fort Knox TSF	Sounding: SCPT16-30 Cone: 479:T375F10U200 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP30.PPF
Depth: 13.500 m / 44.291 ft
Duration: 1300.0 s

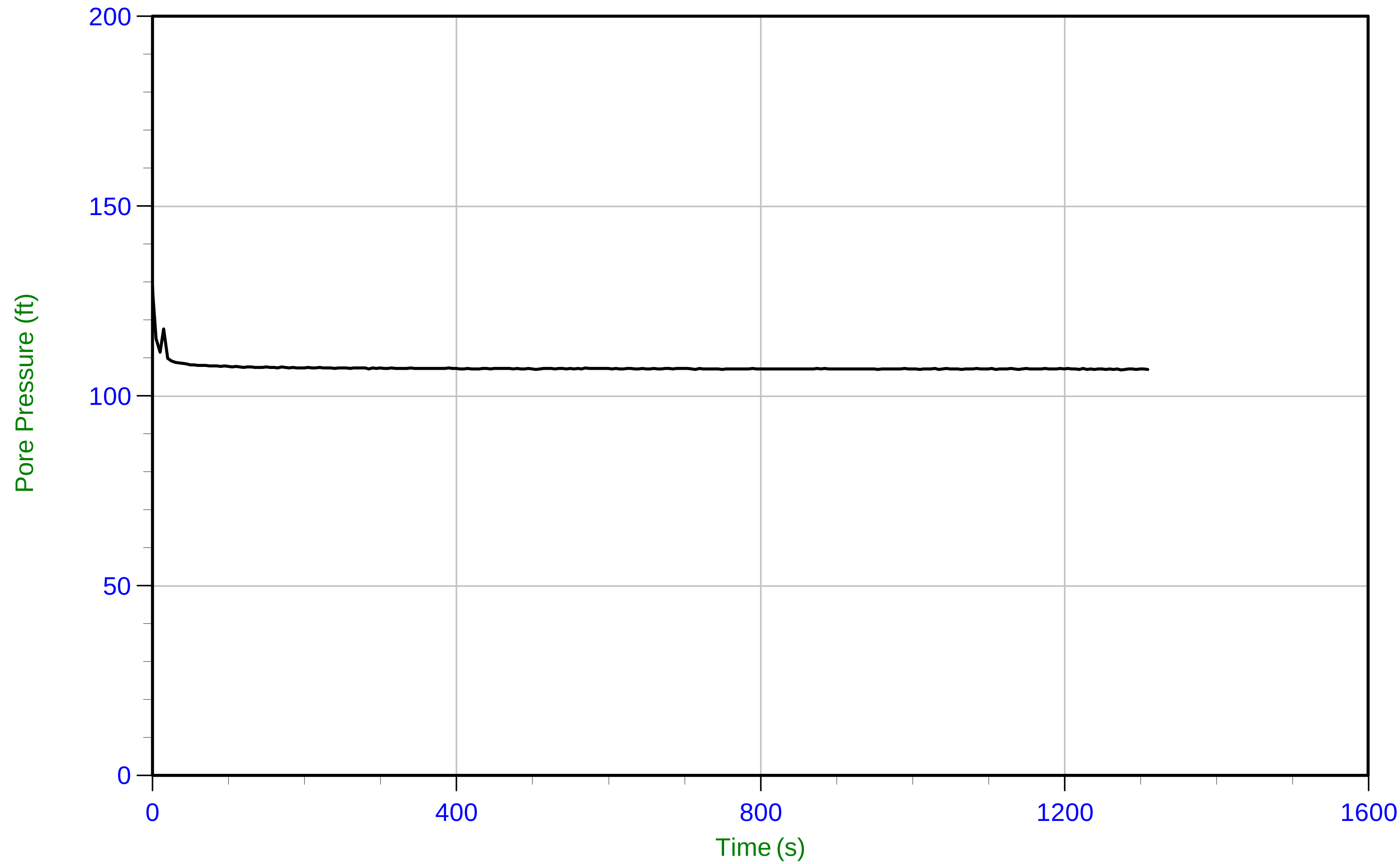
U Min: 3.4 ft
U Max: 590.2 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02/28/2017 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP30.PPF
Depth: 25.375 m / 83.250 ft
Duration: 1310.0 s

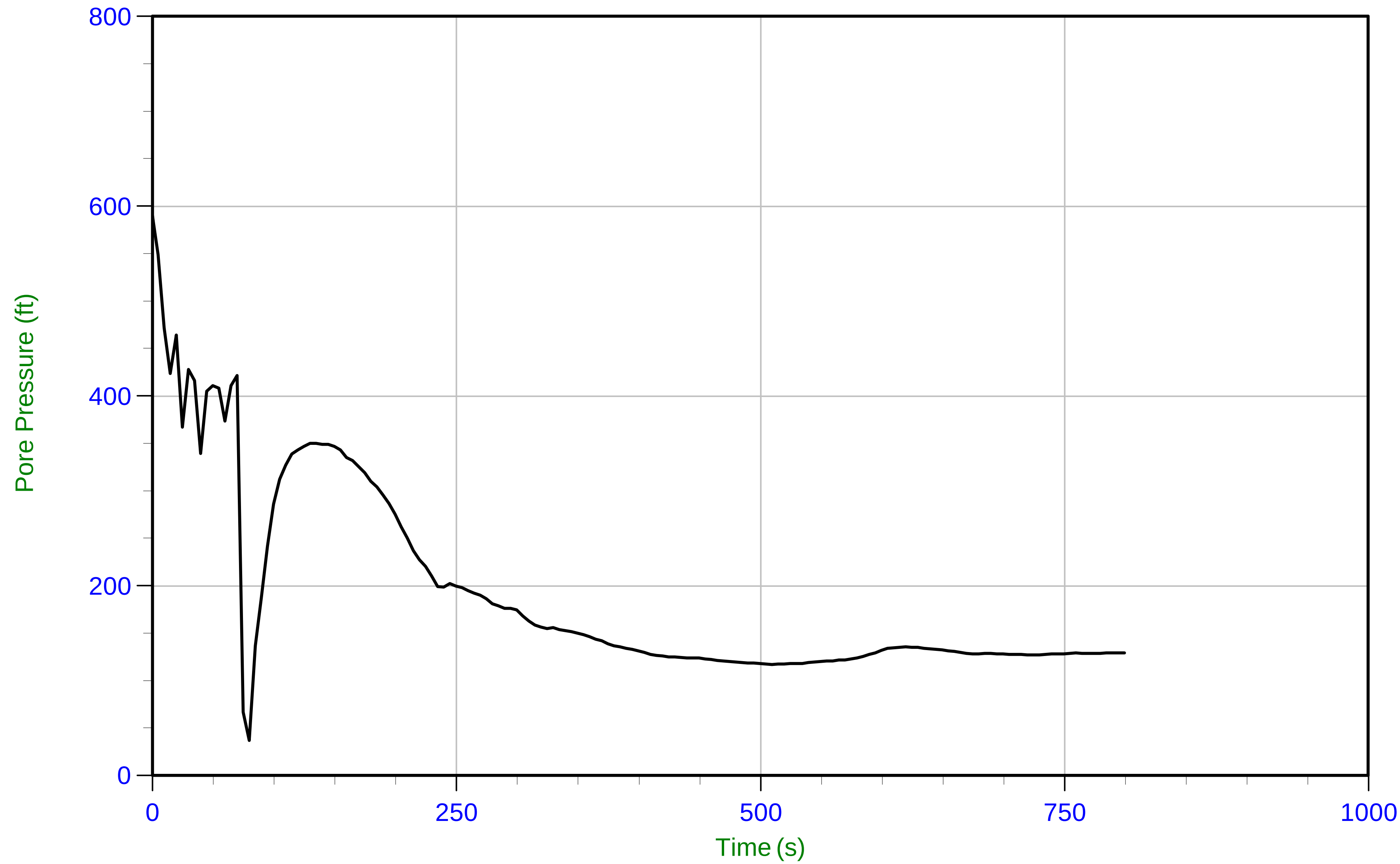
U Min: 106.9 ft
U Max: 129.0 ft

WT: -7.146 m / -23.445 ft
Ueq: 106.7 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 02/28/2017 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP30.PPF
Depth: 28.625 m / 93.913 ft
Duration: 800.0 s

U Min: 37.3 ft
U Max: 590.3 ft

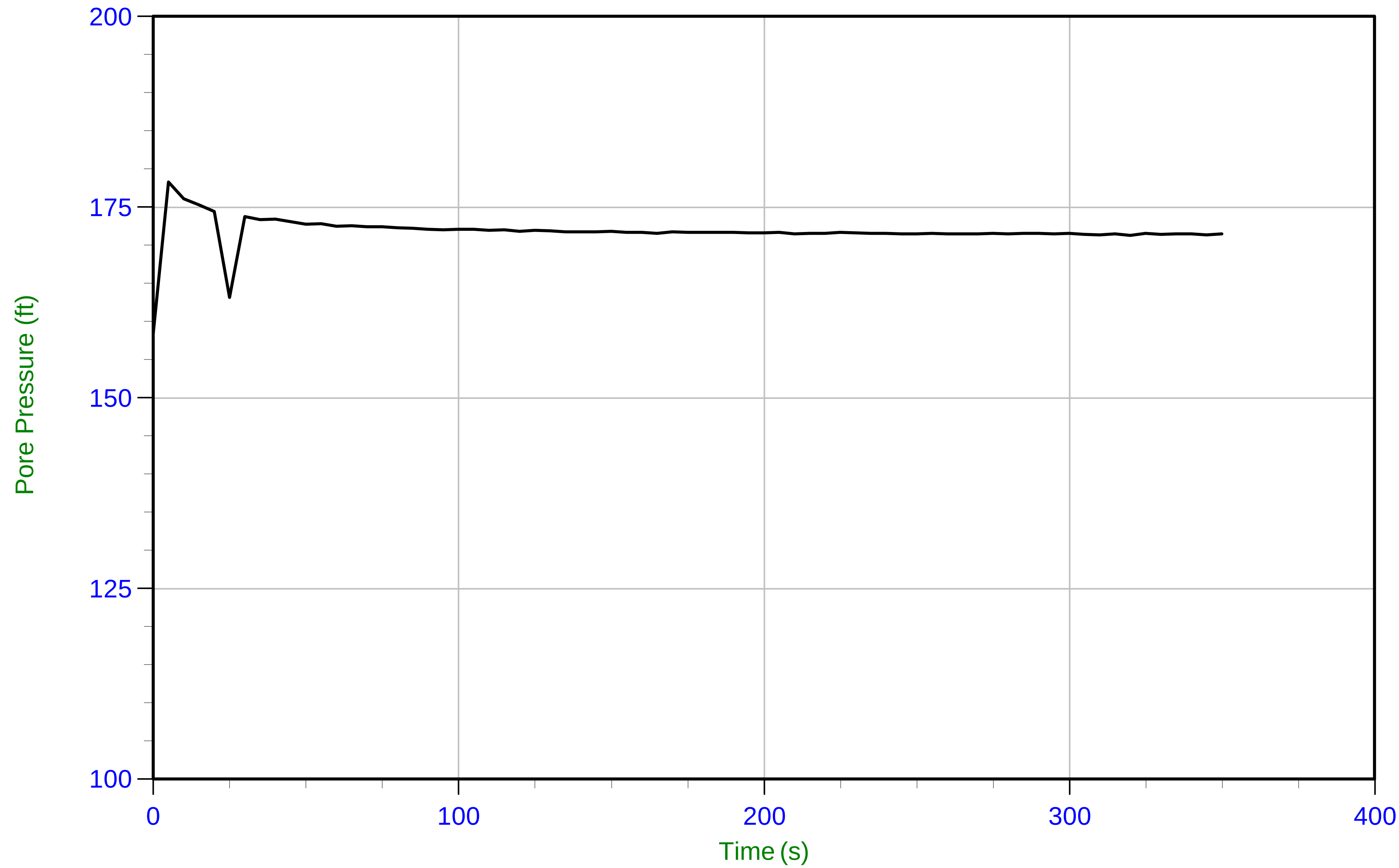
WT: -10.655 m / -34.957 ft
Ueq: 128.9 ft

CONETEC

Fairbanks Gold Mining

Job No: 17-51001
Date: 02/28/2017 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200 Area=15 cm²



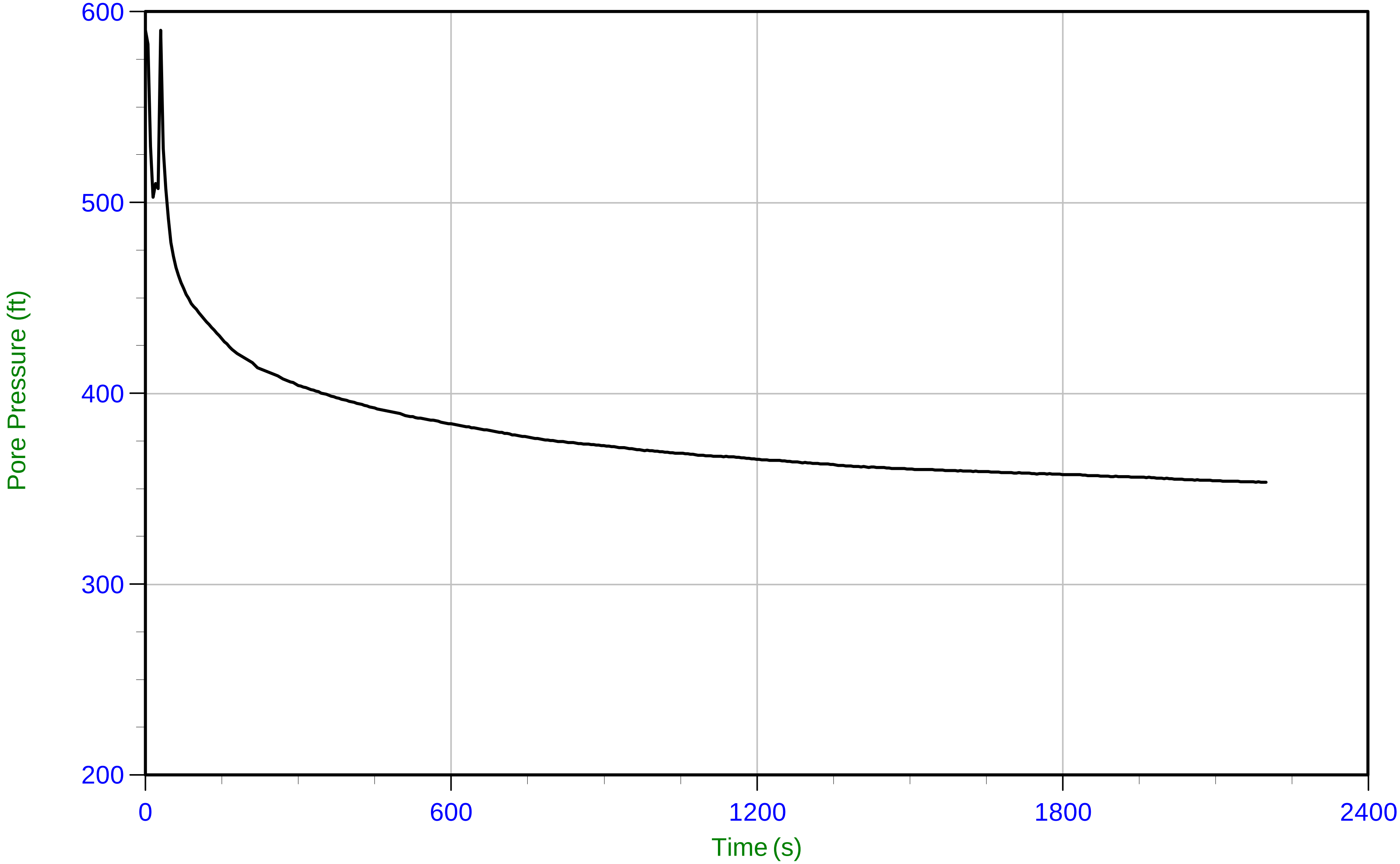
Trace Summary:

Filename: 17-51001_SP30.PPF	U Min: 158.4 ft	WT: -2.310 m / -7.579 ft
Depth: 49.850 m / 163.548 ft	U Max: 178.3 ft	Ueq: 171.1 ft
Duration: 350.0 s		

Fairbanks Gold Mining

Job No: 17-51001
Date: 02/28/2017 23:06
Site: Fort Knox TSF

Sounding: SCPT16-30
Cone: 479:T375F10U200 Area=15 cm²



Trace Summary:

Filename: 17-51001_SP30.PPF
Depth: 57.025 m / 187.088 ft
Duration: 2200.0 s

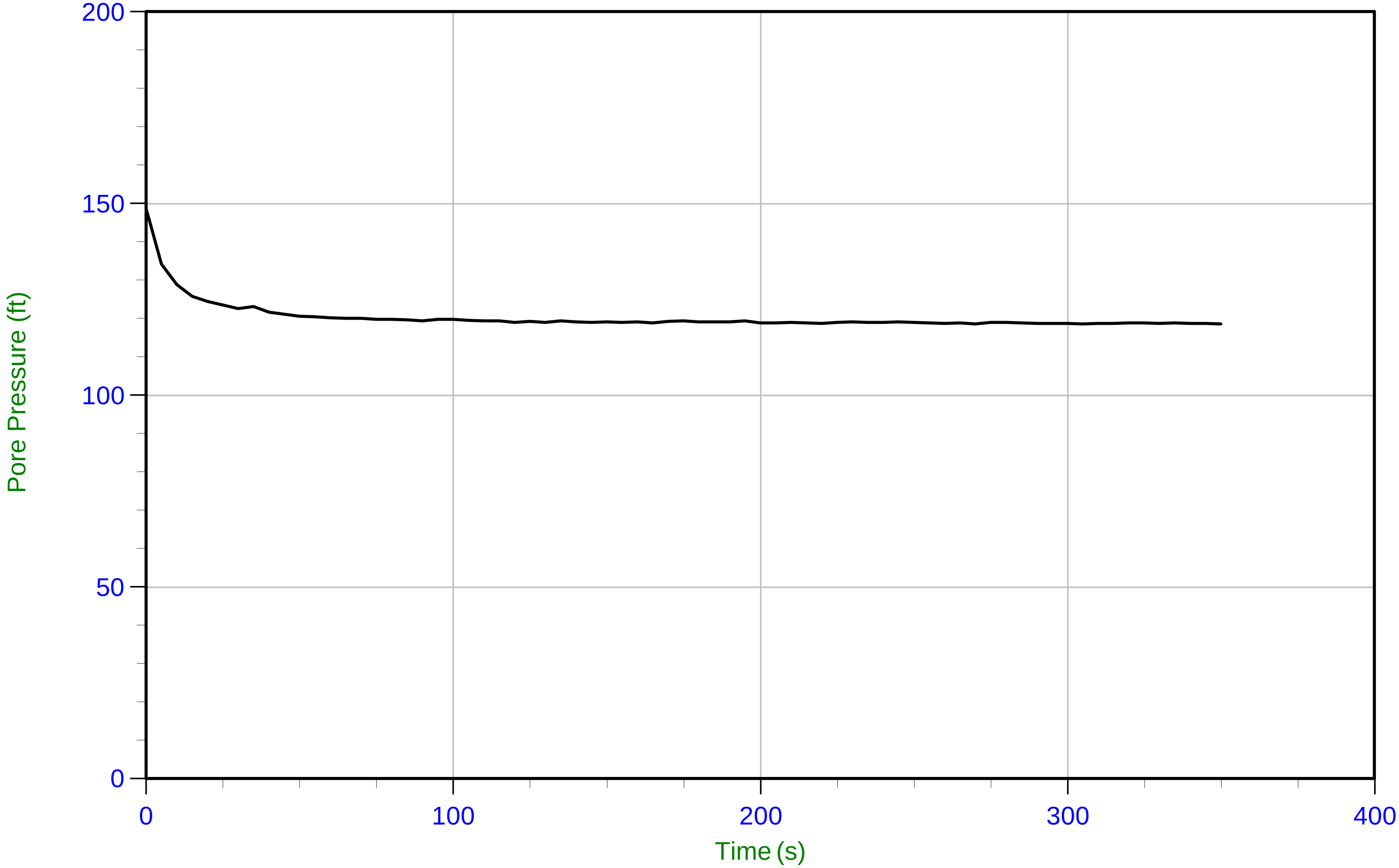
U Min: 353.4 ft
U Max: 590.3 ft

ConeTec

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/10/2017 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP32.PPF
Depth: 40.950 m / 134.349 ft
Duration: 350.0 s

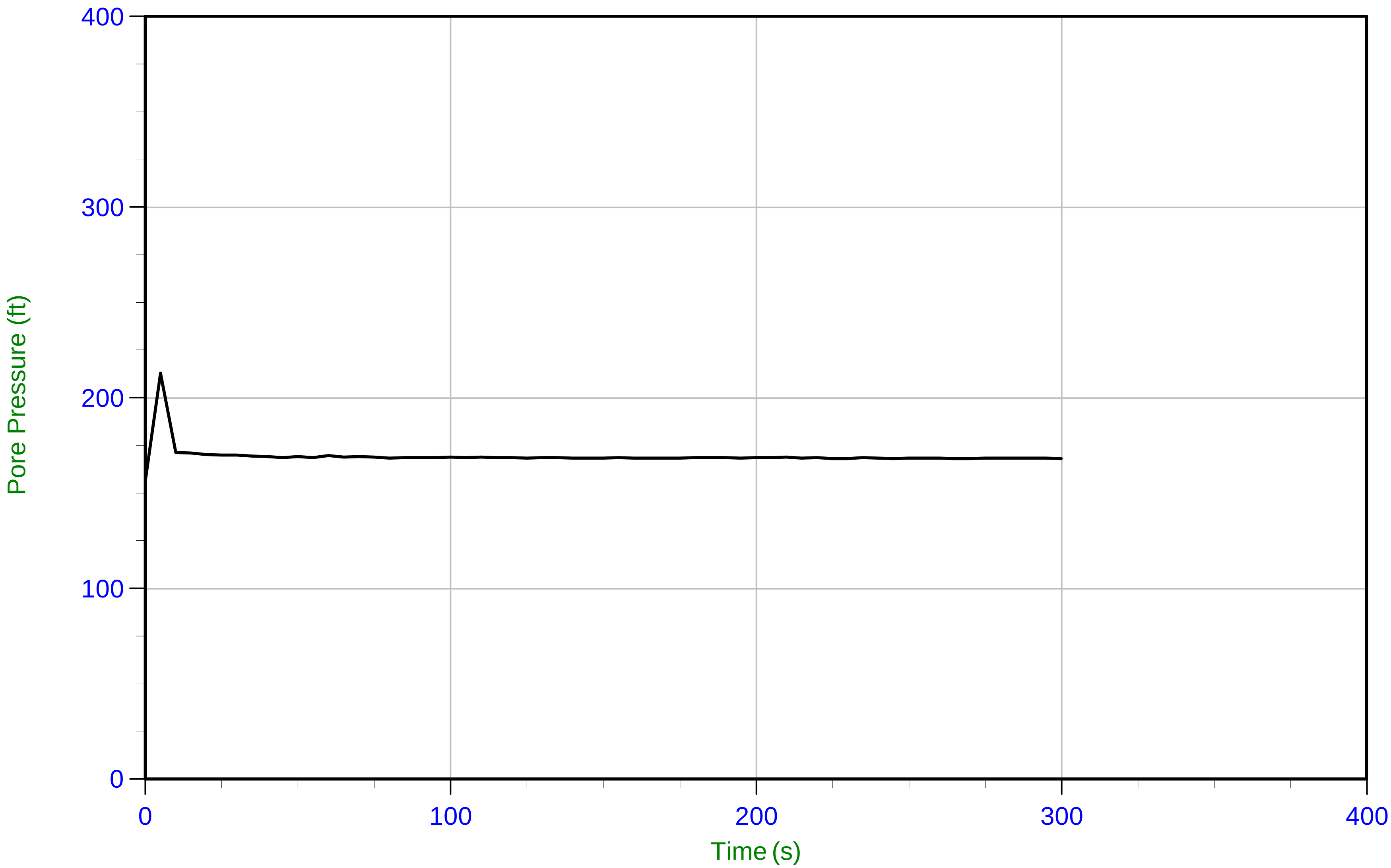
U Min: 118.6 ft
U Max: 148.7 ft

WT: 4.731 m / 15.521 ft
Ueq: 118.8 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/10/2017 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP32.PPF
Depth: 56.775 m / 186.267 ft
Duration: 300.0 s

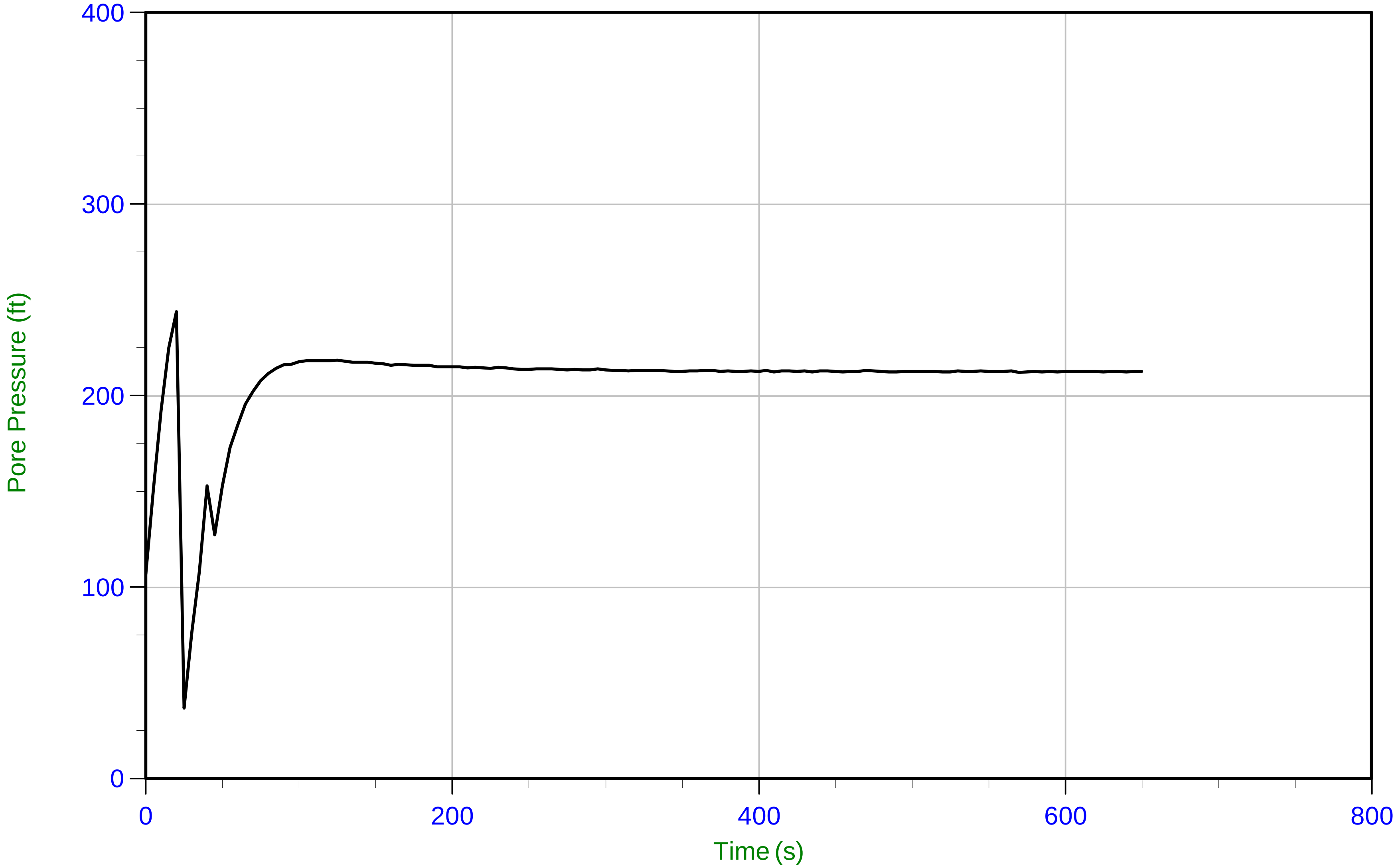
U Min: 156.1 ft
U Max: 213.1 ft

WT: 5.507 m / 18.067 ft
Ueq: 168.2 ft

Fairbanks Gold Mining

Job No: 17-51001
Date: 03/10/2017 02:51
Site: Fort Knox TSF

Sounding: SCPT17-32
Cone: 473:T1500F15U1K Area=15 cm²



Trace Summary:

Filename: 17-51001_SP32.PPF
Depth: 71.375 m / 234.167 ft
Duration: 650.0 s

U Min: 36.8 ft
U Max: 244.0 ft

WT: 6.844 m / 22.454 ft
Ueq: 211.7 ft

Knight Piésold
CONSULTING

Appendix C

Tailing Geotechnical Laboratory Testing

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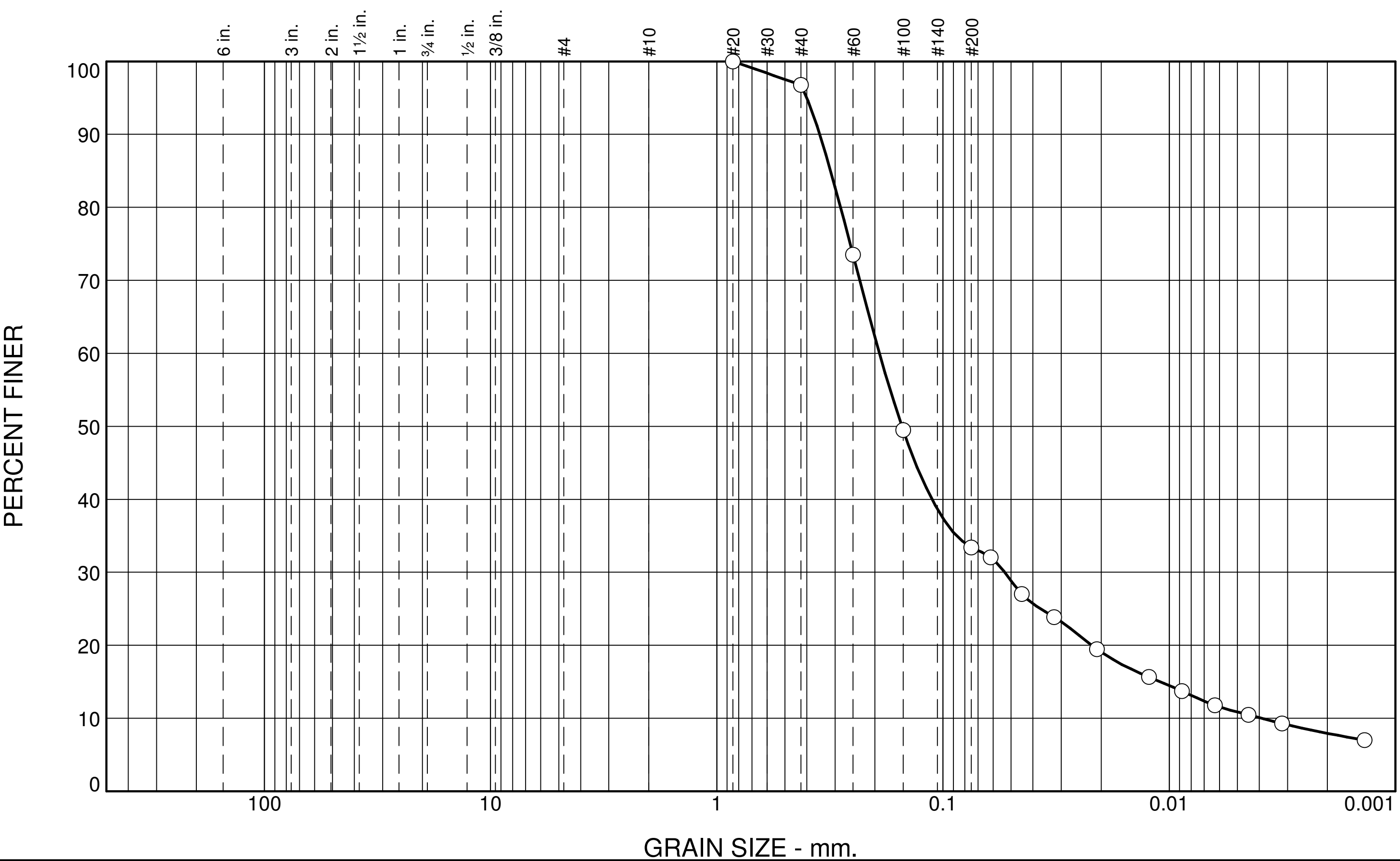
Appendix C-1

Tailing Index Testing

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	3.2	63.4	25.5	7.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#20	100.0		
#40	96.8		
#60	73.5		
#100	49.5		
#200	33.4		
0.0616 mm.	32.1		
0.0448 mm.	27.0		
0.0322 mm.	23.9		
0.0208 mm.	19.5		
0.0123 mm.	15.6		
0.0088 mm.	13.7		
0.0063 mm.	11.8		
0.0045 mm.	10.5		
0.0032 mm.	9.3		
0.0014 mm.	7.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.3506 D_{85}= 0.3139 D_{60}= 0.1909
D_{50}= 0.1520 D_{30}= 0.0534 D_{15}= 0.0110
D_{10}= 0.0039 C_u= 48.98 C_c= 3.84

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

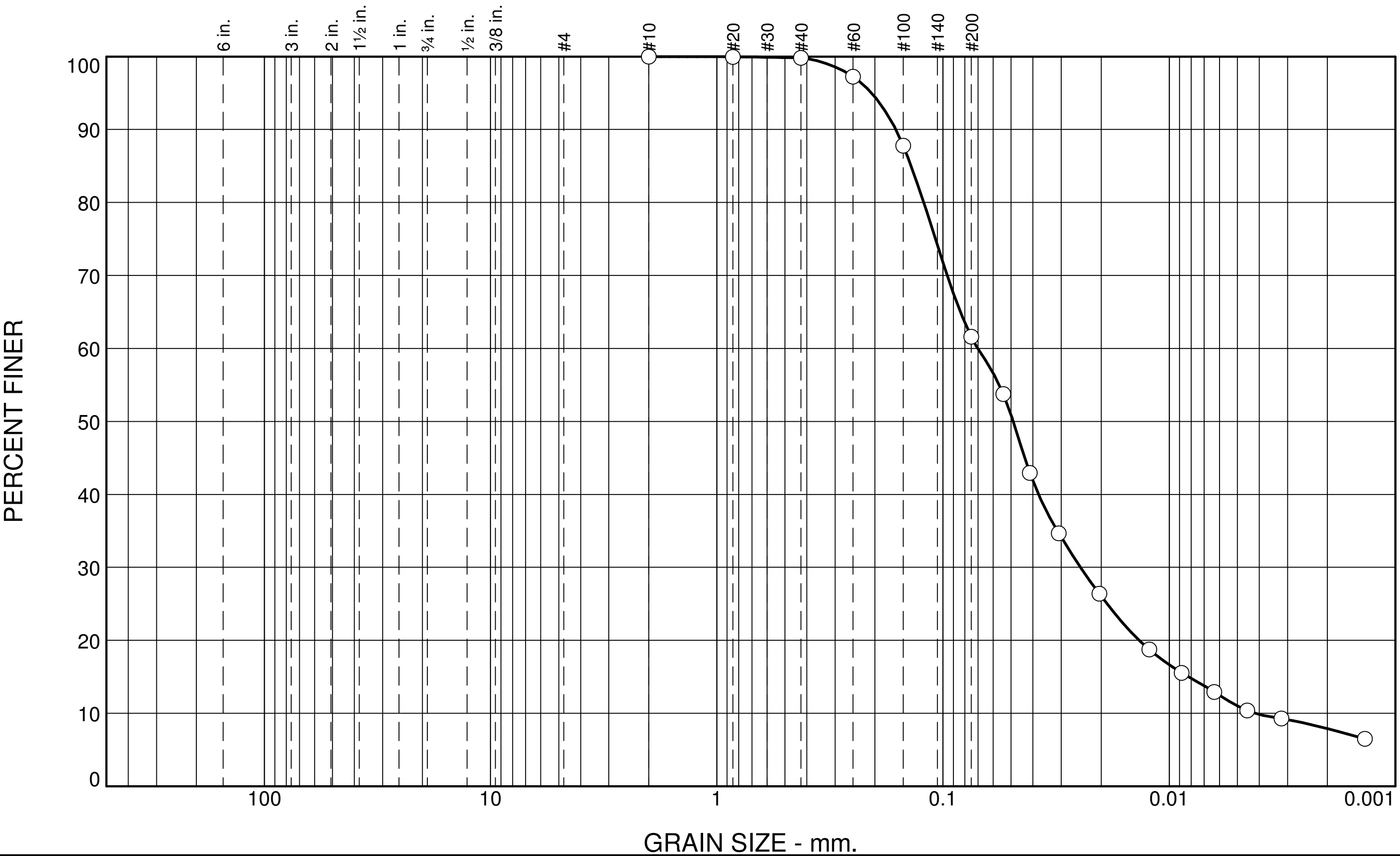
Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-30 **Elev./Depth:** 140'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	38.2	53.7	7.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.8		
#60	97.2		
#100	87.8		
#200	61.6		
0.0541 mm.	53.8		
0.0413 mm.	42.9		
0.0307 mm.	34.7		
0.0204 mm.	26.4		
0.0123 mm.	18.7		
0.0088 mm.	15.6		
0.0063 mm.	12.9		
0.0045 mm.	10.4		
0.0032 mm.	9.3		
0.0014 mm.	6.5		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.1617 D_{85}= 0.1383 D_{60}= 0.0701
D_{50}= 0.0490 D_{30}= 0.0246 D_{15}= 0.0082
D_{10}= 0.0042 C_u= 16.80 C_c= 2.07

Classification

USCS= ML AASHTO= A-4(0)

Remarks

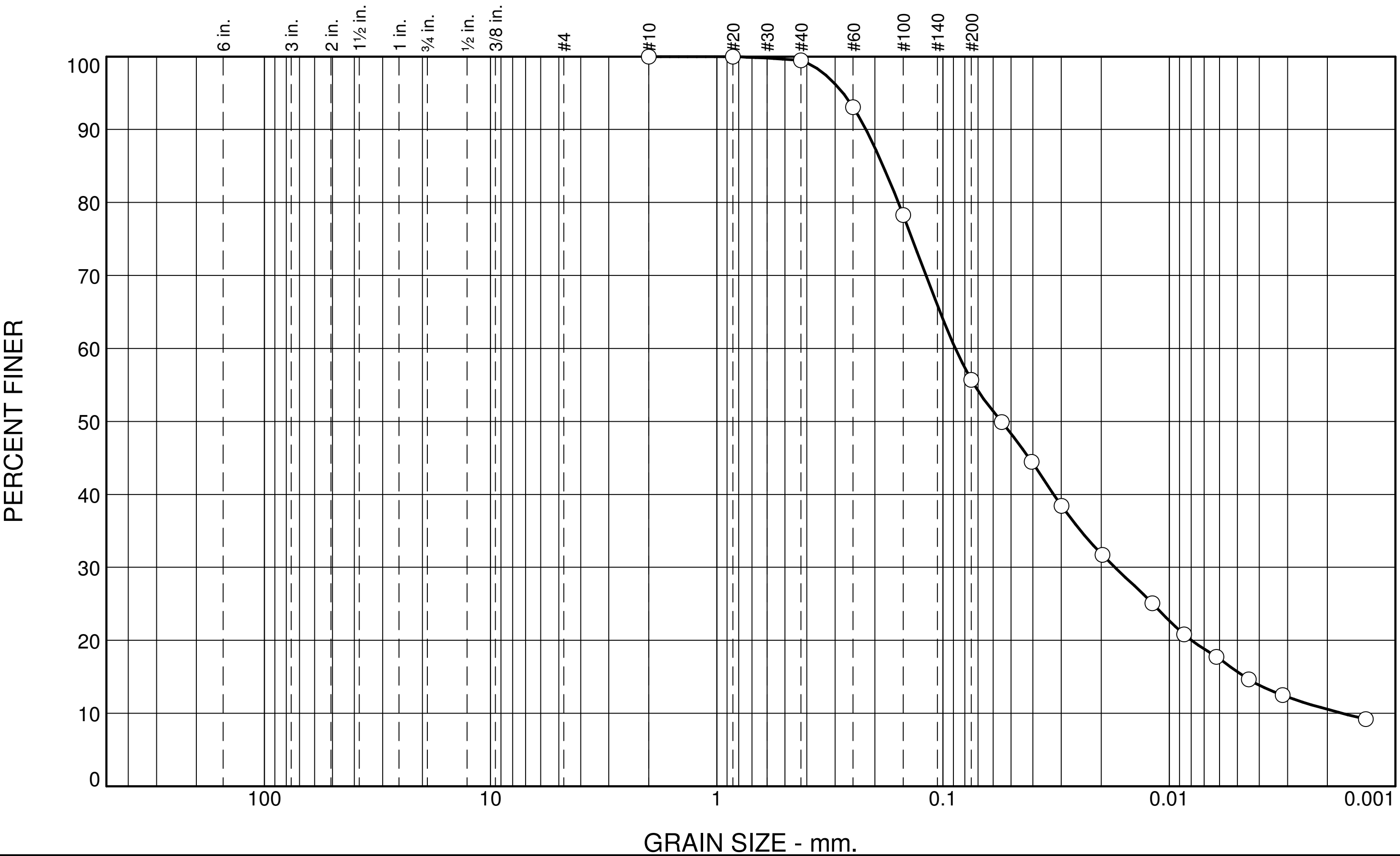
Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-23 **Elev./Depth:** 30'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	43.8	45.2	10.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.5		
#60	93.1		
#100	78.3		
#200	55.7		
0.0550 mm.	49.9		
0.0405 mm.	44.5		
0.0299 mm.	38.4		
0.0198 mm.	31.7		
0.0119 mm.	25.1		
0.0086 mm.	20.8		
0.0062 mm.	17.7		
0.0045 mm.	14.7		
0.0032 mm.	12.5		
0.0014 mm.	9.2		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP   LL= 23   PI= NP

Coefficients

D_{90}= 0.2192 D_{85}= 0.1839 D_{60}= 0.0881
D_{50}= 0.0553 D_{30}= 0.0174 D_{15}= 0.0046
D_{10}= 0.0017 C_u= 51.32 C_c= 1.99

Classification

USCS= ML   AASHTO= A-4(0)

Remarks

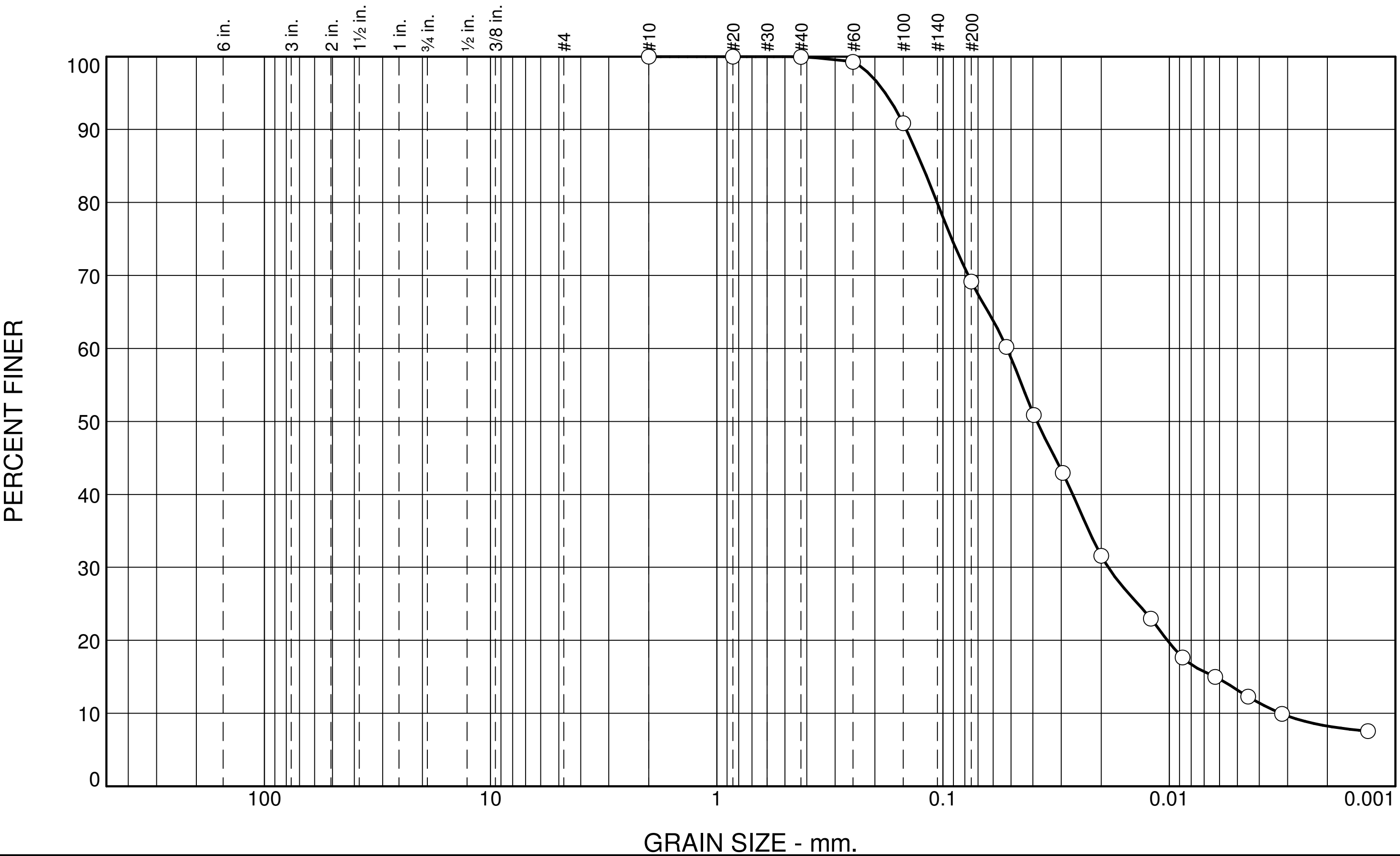
Sample No.:   **Source of Sample:**   **Date:** 4/11/17
Location: CPT-23   **Elev./Depth:** 150'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08   **Figure**

Tested By: EAG   **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	30.8	61.0	8.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	100.0		
#60	99.3		
#100	90.9		
#200	69.2		
0.0524 mm.	60.2		
0.0397 mm.	50.9		
0.0295 mm.	42.9		
0.0199 mm.	31.6		
0.0120 mm.	23.0		
0.0087 mm.	17.6		
0.0063 mm.	15.0		
0.0045 mm.	12.3		
0.0032 mm.	9.9		
0.0013 mm.	7.6		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.1454 D_{85}= 0.1233 D_{60}= 0.0521
D_{50}= 0.0385 D_{30}= 0.0186 D_{15}= 0.0063
D_{10}= 0.0032 C_u= 16.17 C_c= 2.06

Classification

USCS= ML AASHTO= A-4(0)

Remarks

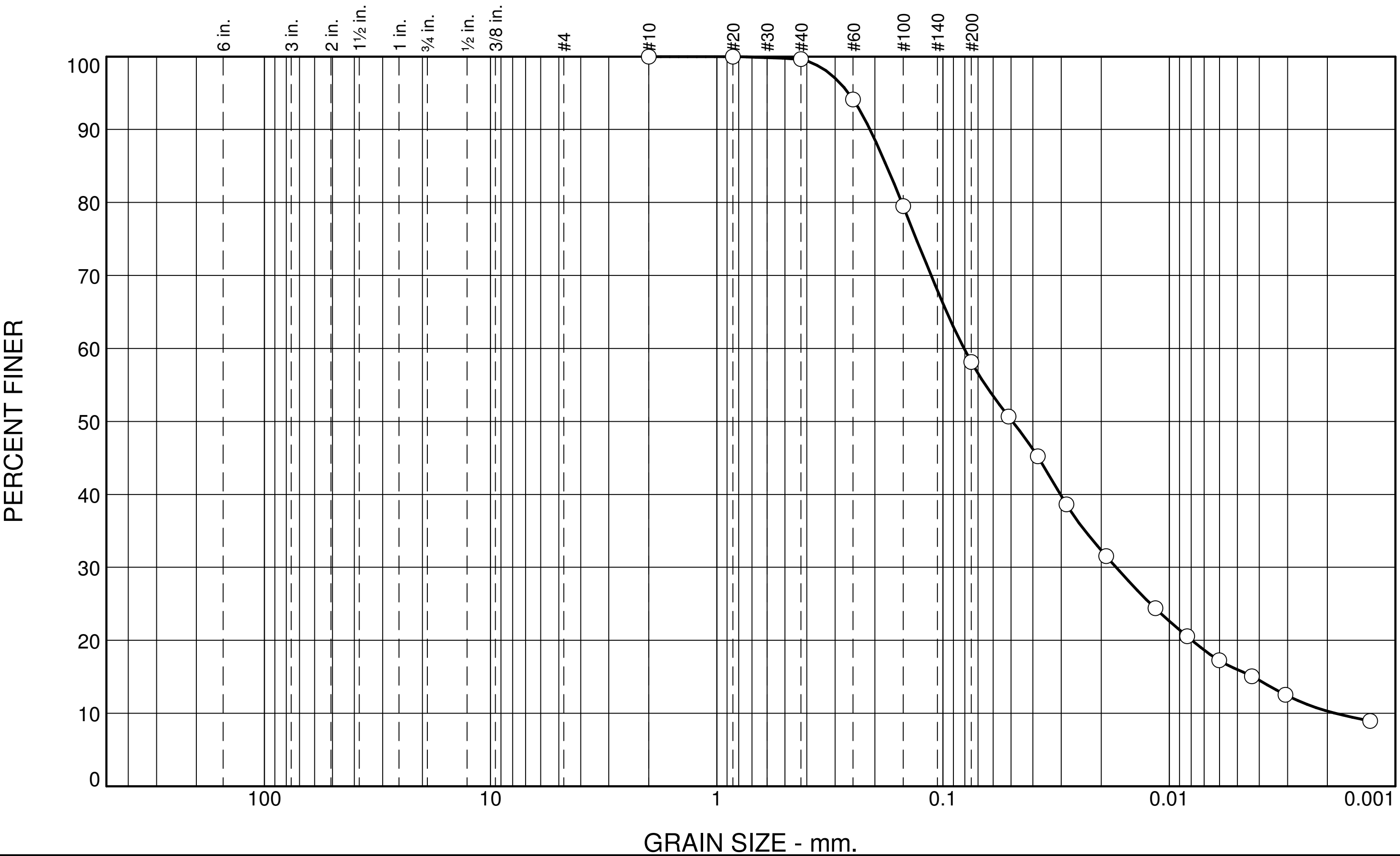
Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-24 **Elev./Depth:** 30'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	41.4	47.9	10.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.6		
#60	94.1		
#100	79.5		
#200	58.2		
0.0513 mm.	50.7		
0.0381 mm.	45.2		
0.0285 mm.	38.6		
0.0190 mm.	31.5		
0.0115 mm.	24.4		
0.0083 mm.	20.6		
0.0060 mm.	17.3		
0.0043 mm.	15.1		
0.0031 mm.	12.5		
0.0013 mm.	8.9		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2103 D_{85}= 0.1775 D_{60}= 0.0807
D_{50}= 0.0494 D_{30}= 0.0172 D_{15}= 0.0043
D_{10}= 0.0018 C_u= 43.94 C_c= 1.99

Classification

USCS= ML AASHTO= A-4(0)

Remarks

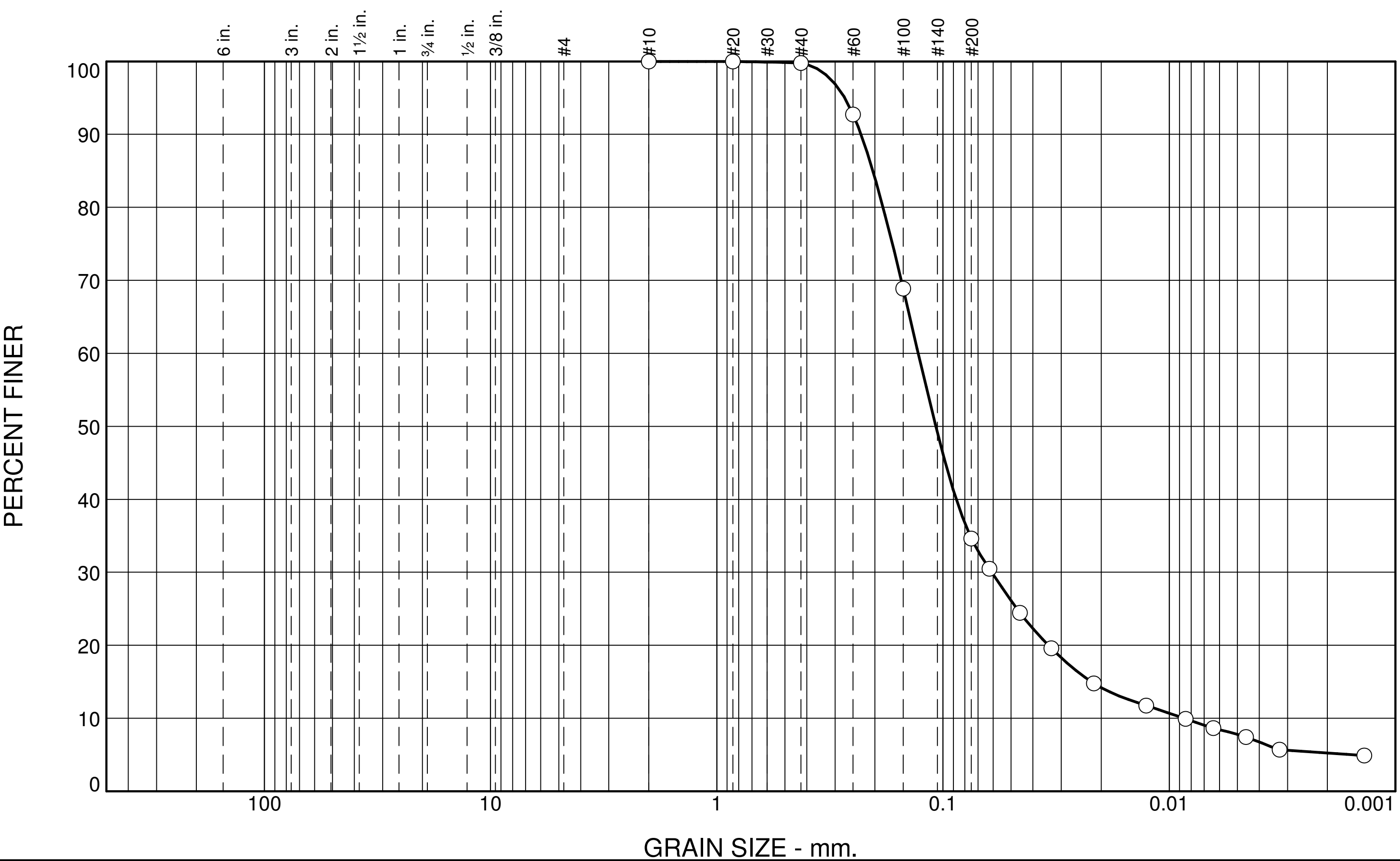
Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-24 **Elev./Depth:** 160'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	65.2	29.4	5.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.8		
#60	92.7		
#100	68.9		
#200	34.6		
0.0624 mm.	30.5		
0.0457 mm.	24.4		
0.0332 mm.	19.6		
0.0215 mm.	14.8		
0.0126 mm.	11.7		
0.0085 mm.	9.9		
0.0064 mm.	8.7		
0.0046 mm.	7.4		
0.0032 mm.	5.7		
0.0014 mm.	4.9		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2305 D_{85}= 0.2042 D_{60}= 0.1286
D_{50}= 0.1076 D_{30}= 0.0609 D_{15}= 0.0221
D_{10}= 0.0086 C_u= 14.96 C_c= 3.35

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

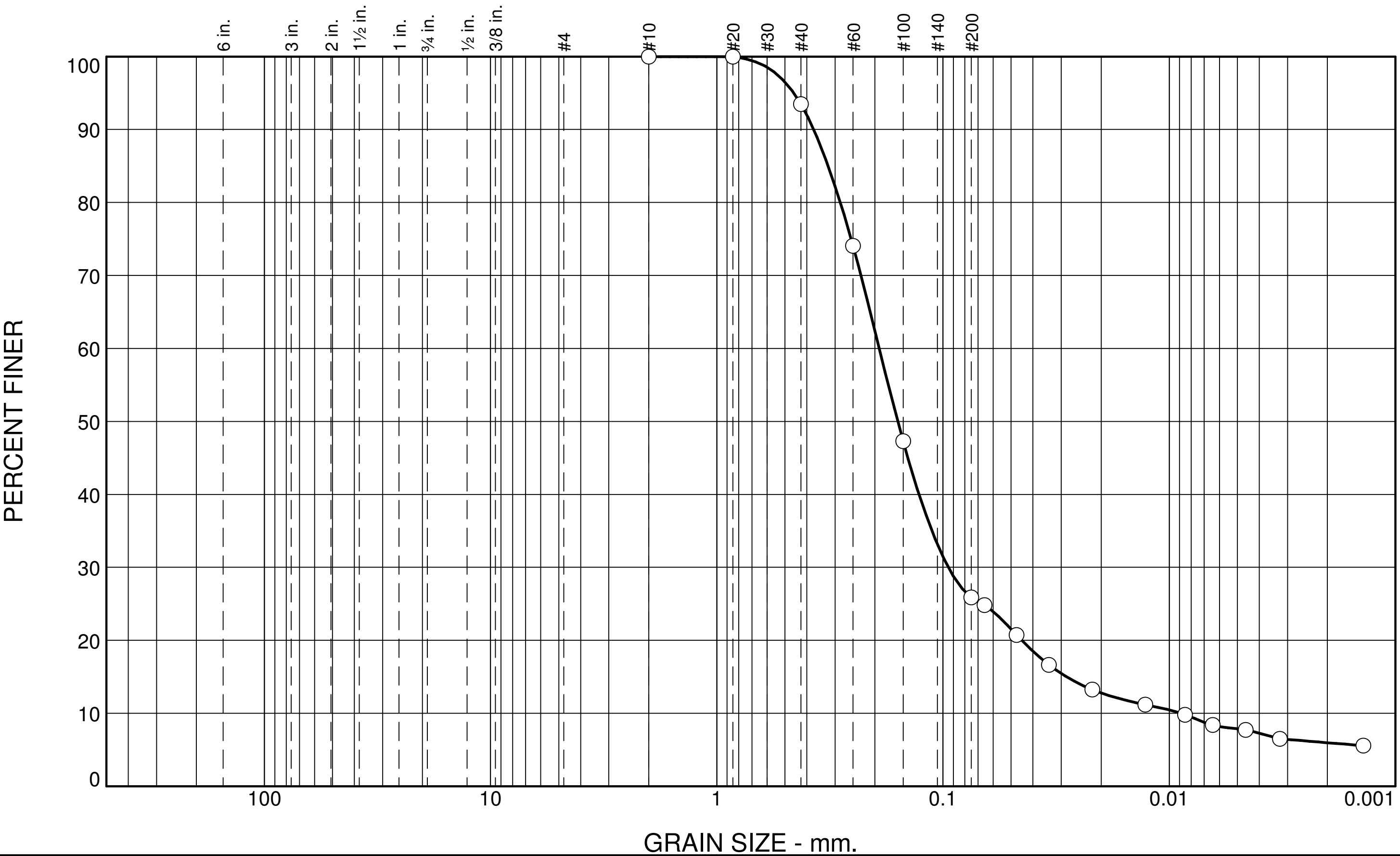
Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-25 **Elev./Depth:** 20'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	6.5	67.6	19.9	6.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	93.5		
#60	74.1		
#100	47.3		
#200	25.9		
0.0656 mm.	24.8		
0.0473 mm.	20.7		
0.0341 mm.	16.7		
0.0219 mm.	13.2		
0.0128 mm.	11.2		
0.0085 mm.	9.8		
0.0064 mm.	8.4		
0.0046 mm.	7.7		
0.0032 mm.	6.5		
0.0014 mm.	5.6		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.3730 D_{85}= 0.3217 D_{60}= 0.1913
D_{50}= 0.1584 D_{30}= 0.0947 D_{15}= 0.0285
D_{10}= 0.0089 C_u= 21.54 C_c= 5.28

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-25 **Elev./Depth:** 80'

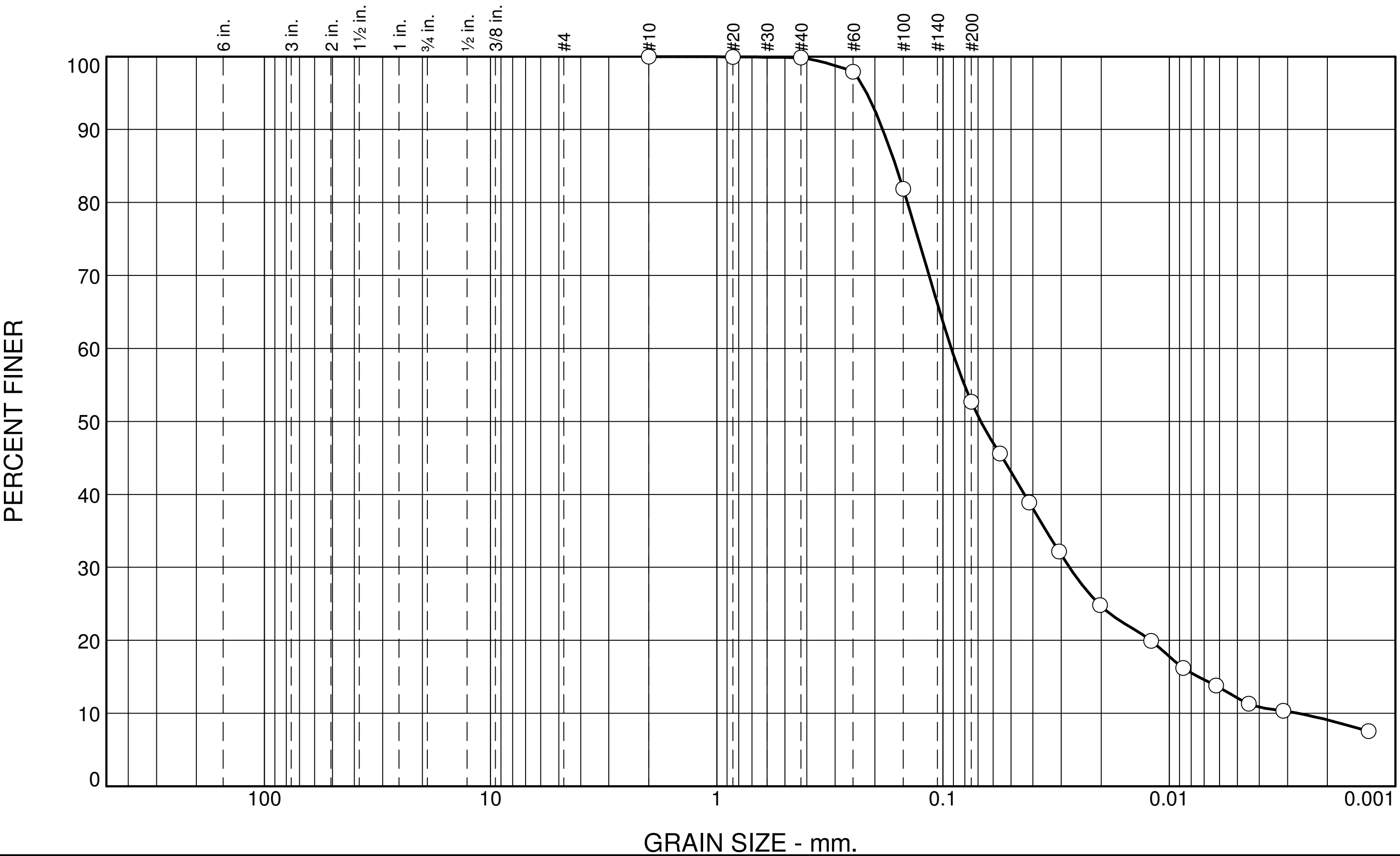
Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD

Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	47.2	43.6	9.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#60	97.9		
#100	81.9		
#200	52.7		
0.0561 mm.	45.6		
0.0416 mm.	38.9		
0.0307 mm.	32.2		
0.0202 mm.	24.8		
0.0120 mm.	19.9		
0.0087 mm.	16.2		
0.0062 mm.	13.8		
0.0044 mm.	11.3		
0.0031 mm.	10.3		
0.0013 mm.	7.5		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.1846 D_{85}= 0.1616 D_{60}= 0.0918
D_{50}= 0.0681 D_{30}= 0.0276 D_{15}= 0.0074
D_{10}= 0.0027 C_u= 33.98 C_c= 3.07

Classification

USCS= ML AASHTO= A-4(0)

Remarks

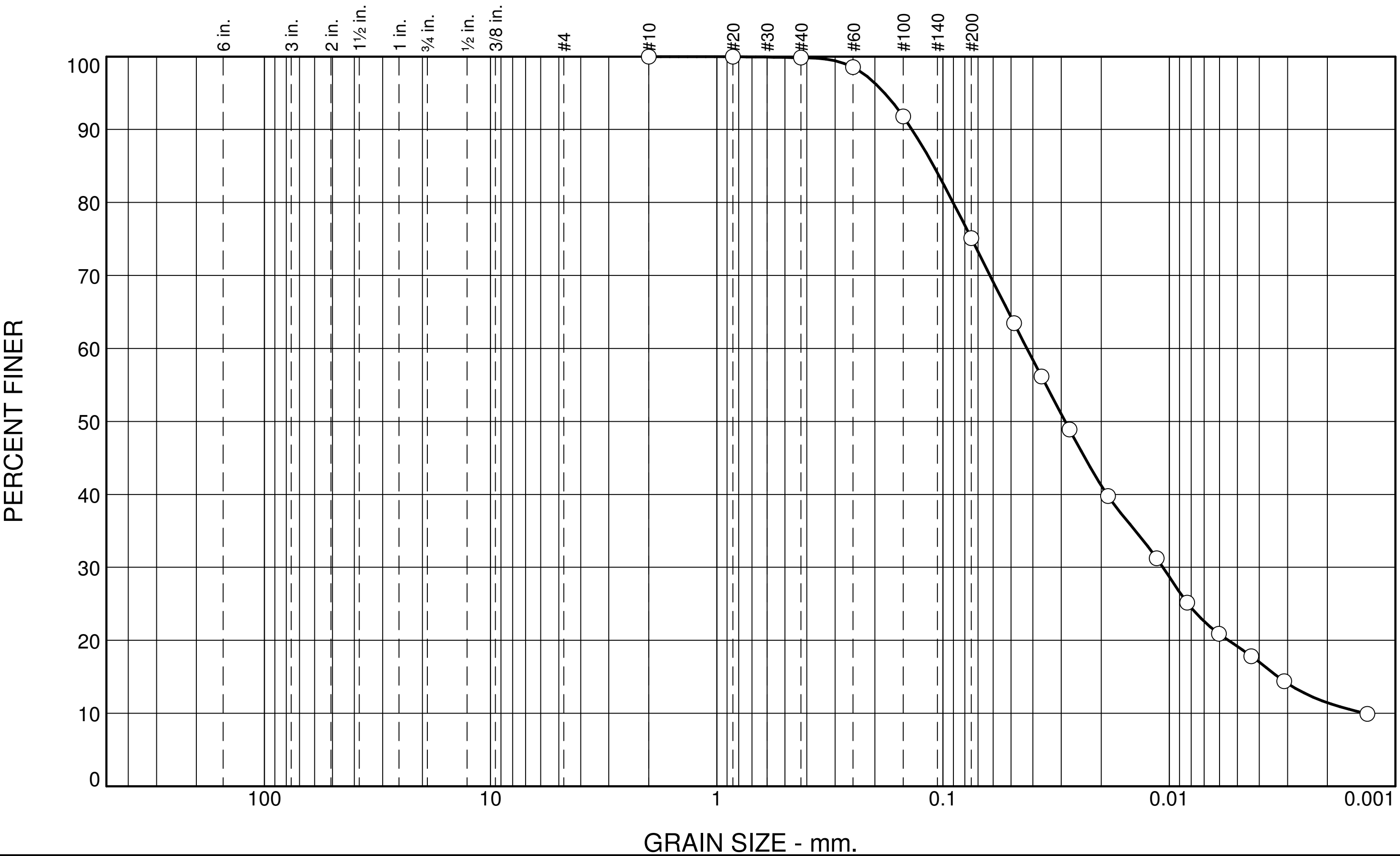
Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-26 **Elev./Depth:** 100'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	24.8	63.6	11.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#60	98.5		
#100	91.8		
#200	75.1		
0.0485 mm.	63.5		
0.0367 mm.	56.2		
0.0276 mm.	48.9		
0.0186 mm.	39.8		
0.0113 mm.	31.3		
0.0083 mm.	25.2		
0.0060 mm.	20.9		
0.0043 mm.	17.8		
0.0031 mm.	14.4		
0.0013 mm.	9.9		

* (no specification provided)

Soil Description

silt with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.1371 D_{85}= 0.1099 D_{60}= 0.0426
D_{50}= 0.0288 D_{30}= 0.0106 D_{15}= 0.0033
D_{10}= 0.0014 C_u= 31.36 C_c= 1.96

Classification

USCS= ML AASHTO= A-4(0)

Remarks

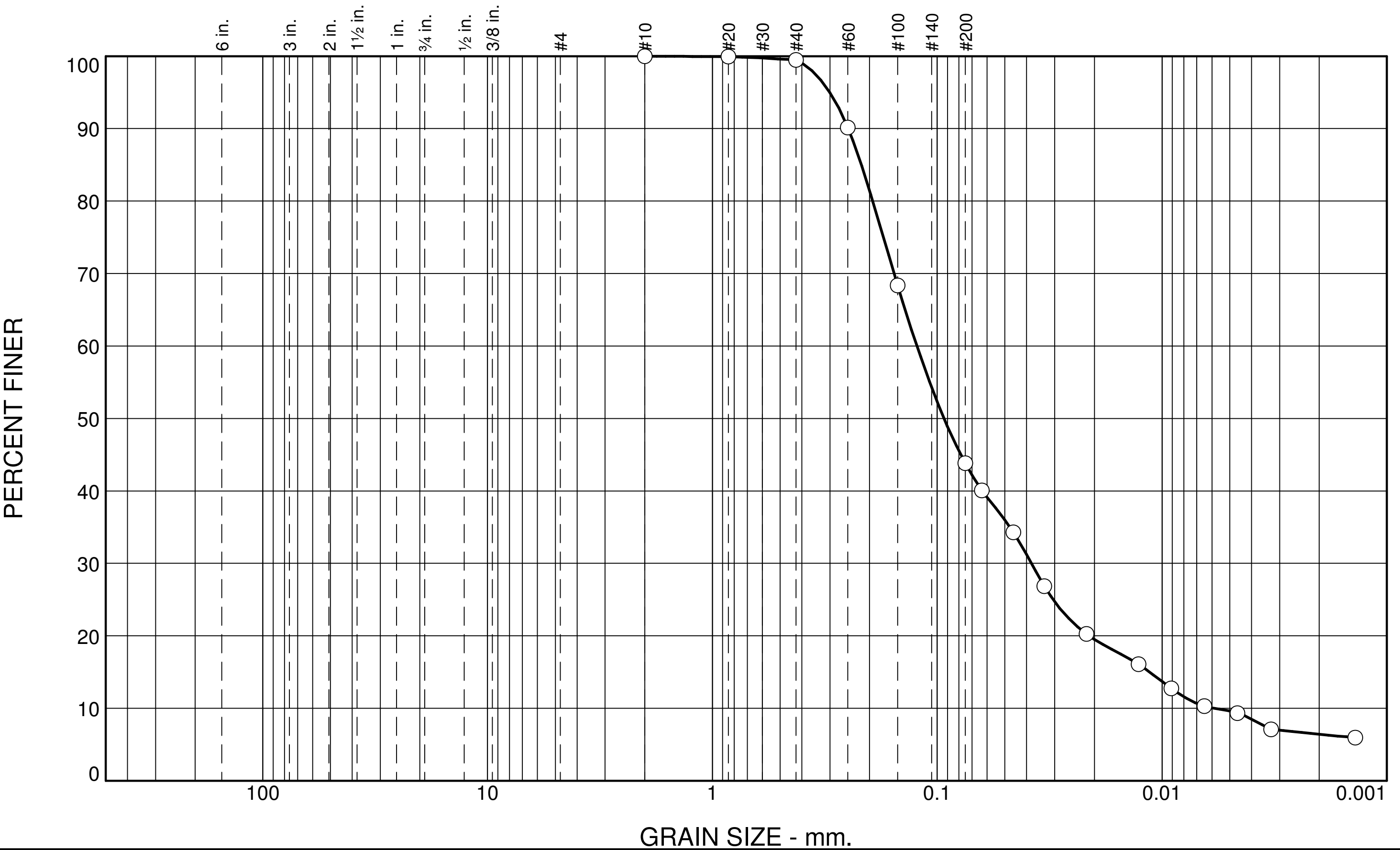
Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-26 **Elev./Depth:** 80'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	55.7	37.4	6.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.5		
#60	90.1		
#100	68.4		
#200	43.8		
0.0632 mm.	40.1		
0.0458 mm.	34.3		
0.0334 mm.	26.9		
0.0217 mm.	20.2		
0.0127 mm.	16.1		
0.0091 mm.	12.8		
0.0065 mm.	10.3		
0.0046 mm.	9.3		
0.0033 mm.	7.1		
0.0014 mm.	5.9		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2490 D_{85}= 0.2175 D_{60}= 0.1231
D_{50}= 0.0932 D_{30}= 0.0381 D_{15}= 0.0113
D_{10}= 0.0059 C_u= 20.80 C_c= 2.00

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-27 **Elev./Depth:** 74'

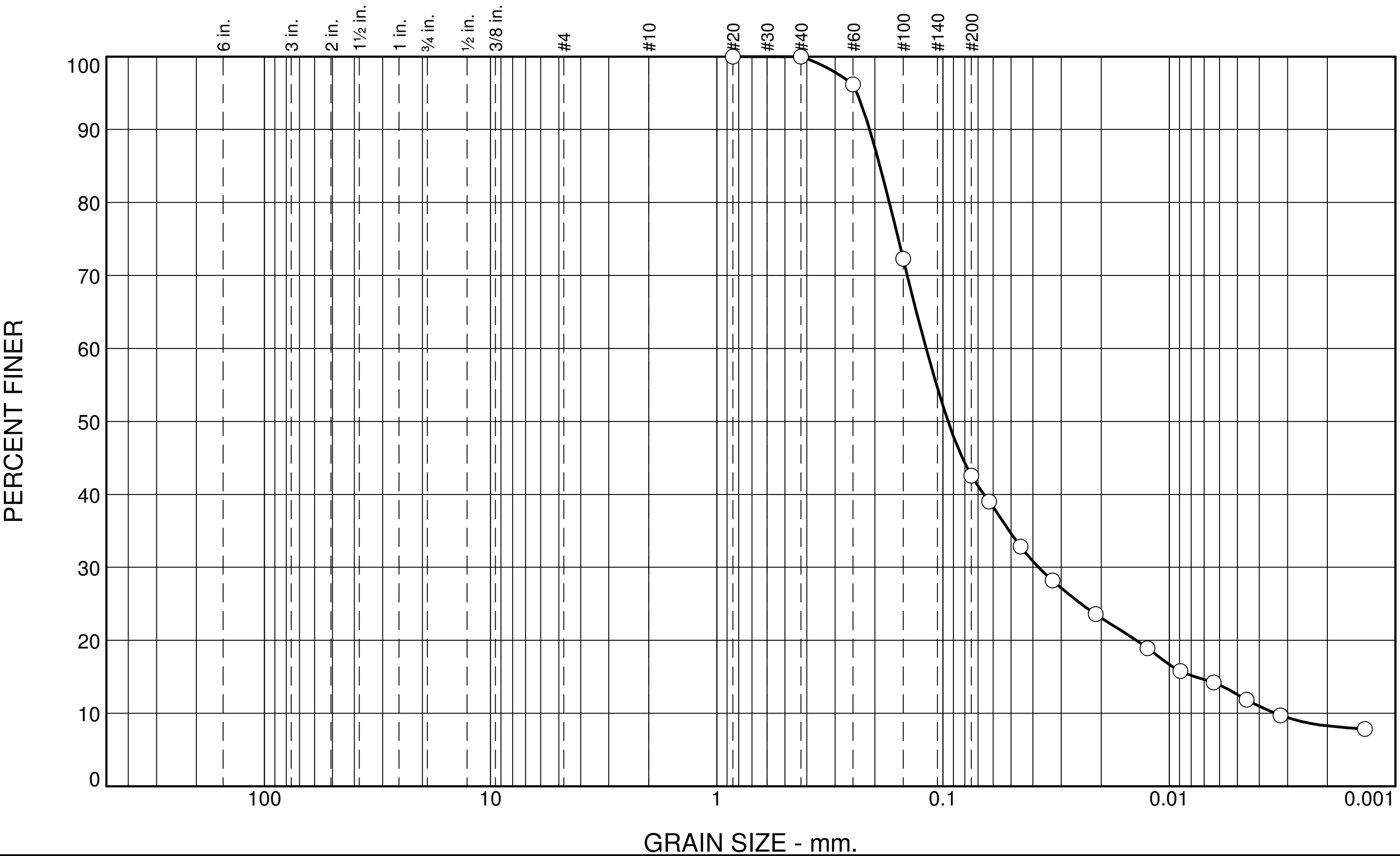
Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD

Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	57.4	34.3	8.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#20	100.0		
#40	100.0		
#60	96.2		
#100	72.3		
#200	42.6		
0.0625 mm.	39.0		
0.0455 mm.	32.9		
0.0328 mm.	28.2		
0.0212 mm.	23.6		
0.0125 mm.	18.9		
0.0089 mm.	15.8		
0.0064 mm.	14.2		
0.0045 mm.	11.9		
0.0032 mm.	9.7		
0.0014 mm.	7.9		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2110 D_{85}= 0.1900 D_{60}= 0.1187
D_{50}= 0.0949 D_{30}= 0.0378 D_{15}= 0.0077
D_{10}= 0.0034 C_u= 34.86 C_c= 3.53

Classification

USCS= SM AASHTO= A-4(0)

Remarks

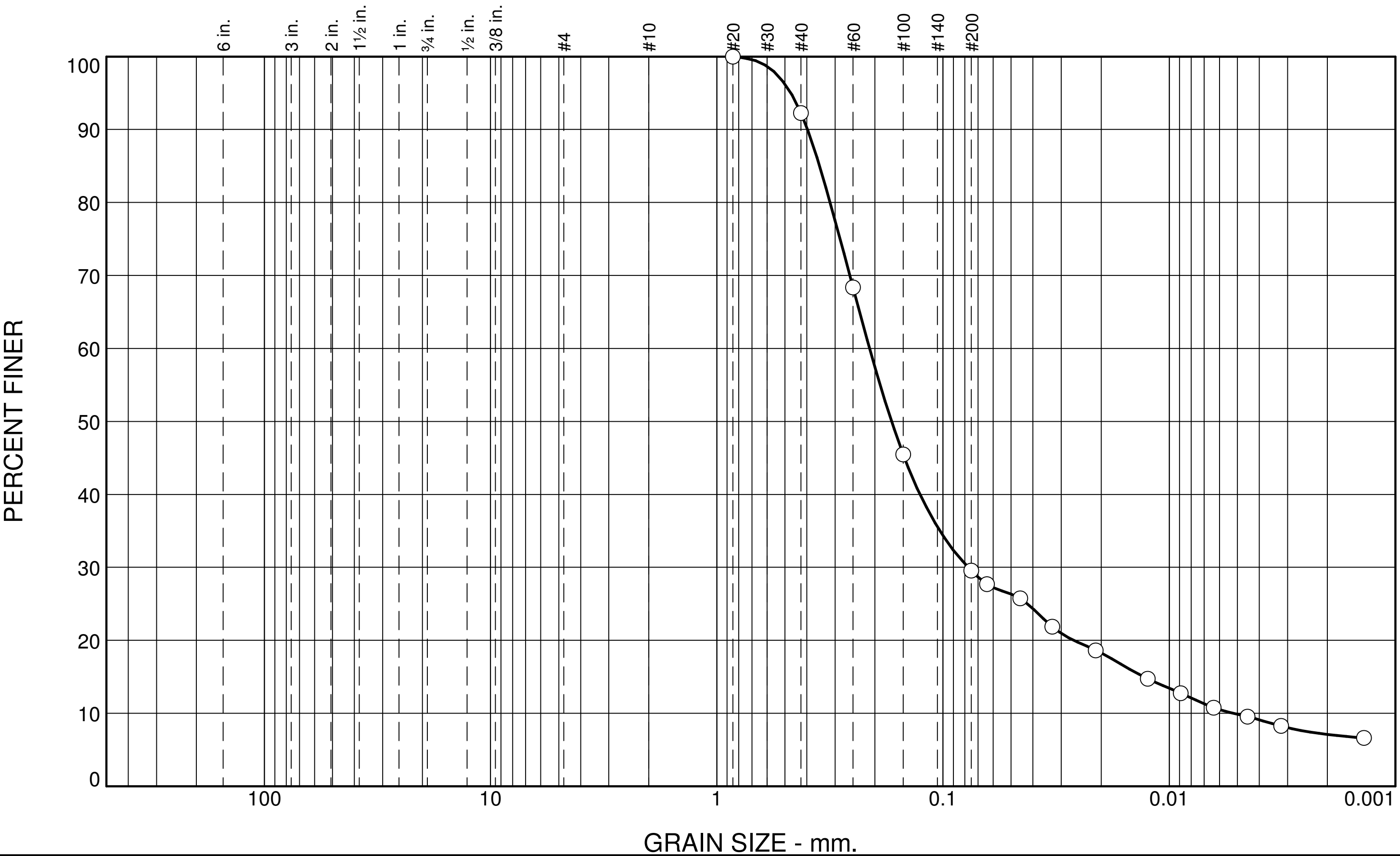
Sample No.: **Source of Sample:** **Date:** 4/11/17
Location: CPT-28 **Elev./Depth:** 50'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	7.8	62.6	22.5	7.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#20	100.0		
#40	92.2		
#60	68.3		
#100	45.5		
#200	29.6		
0.0638 mm.	27.7		
0.0456 mm.	25.7		
0.0329 mm.	21.9		
0.0211 mm.	18.6		
0.0124 mm.	14.7		
0.0089 mm.	12.8		
0.0064 mm.	10.8		
0.0045 mm.	9.5		
0.0032 mm.	8.3		
0.0014 mm.	6.6		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.3976 D_{85}= 0.3512 D_{60}= 0.2111
D_{50}= 0.1687 D_{30}= 0.0774 D_{15}= 0.0130
D_{10}= 0.0052 C_u= 40.84 C_c= 5.49

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

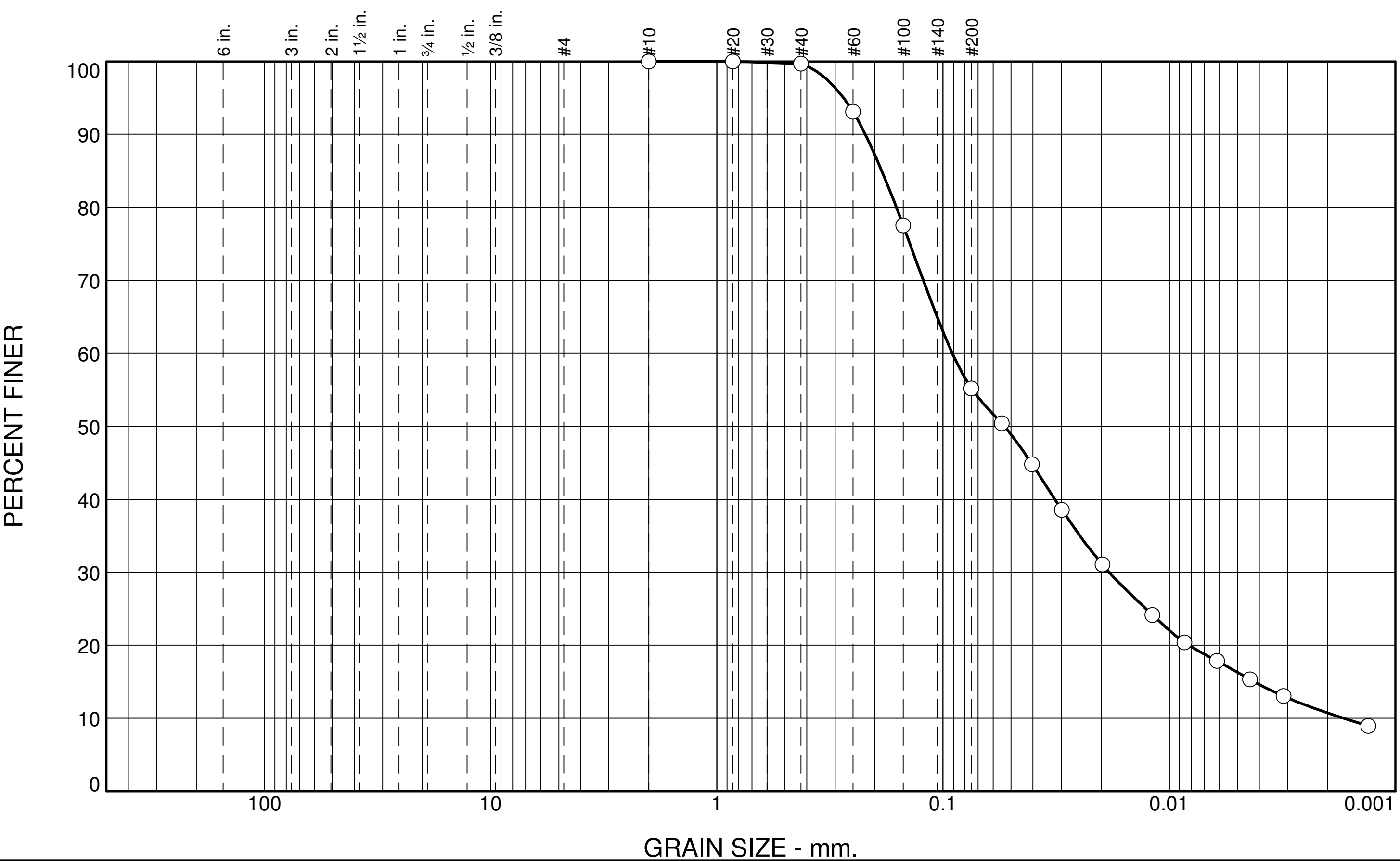
Sample No.:
Location: CPT-28
Source of Sample:
Date: 4/12/17
Elev./Depth: 73'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	44.5	44.5	10.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.7		
#60	93.1		
#100	77.5		
#200	55.2		
0.0549 mm.	50.4		
0.0404 mm.	44.8		
0.0298 mm.	38.6		
0.0197 mm.	31.1		
0.0119 mm.	24.2		
0.0086 mm.	20.4		
0.0061 mm.	17.9		
0.0044 mm.	15.3		
0.0031 mm.	13.0		
0.0013 mm.	8.9		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP   LL= NP   PI= NP

Coefficients

D_{90}= 0.2206 D_{85}= 0.1864 D_{60}= 0.0909
D_{50}= 0.0534 D_{30}= 0.0184 D_{15}= 0.0042
D_{10}= 0.0017 C_u= 53.60 C_c= 2.20

Classification

USCS= ML   AASHTO= A-4(0)

Remarks

Sample No.:   **Source of Sample:**   **Date:** 4/12/17
Location: CPT-29   **Elev./Depth:** 155'

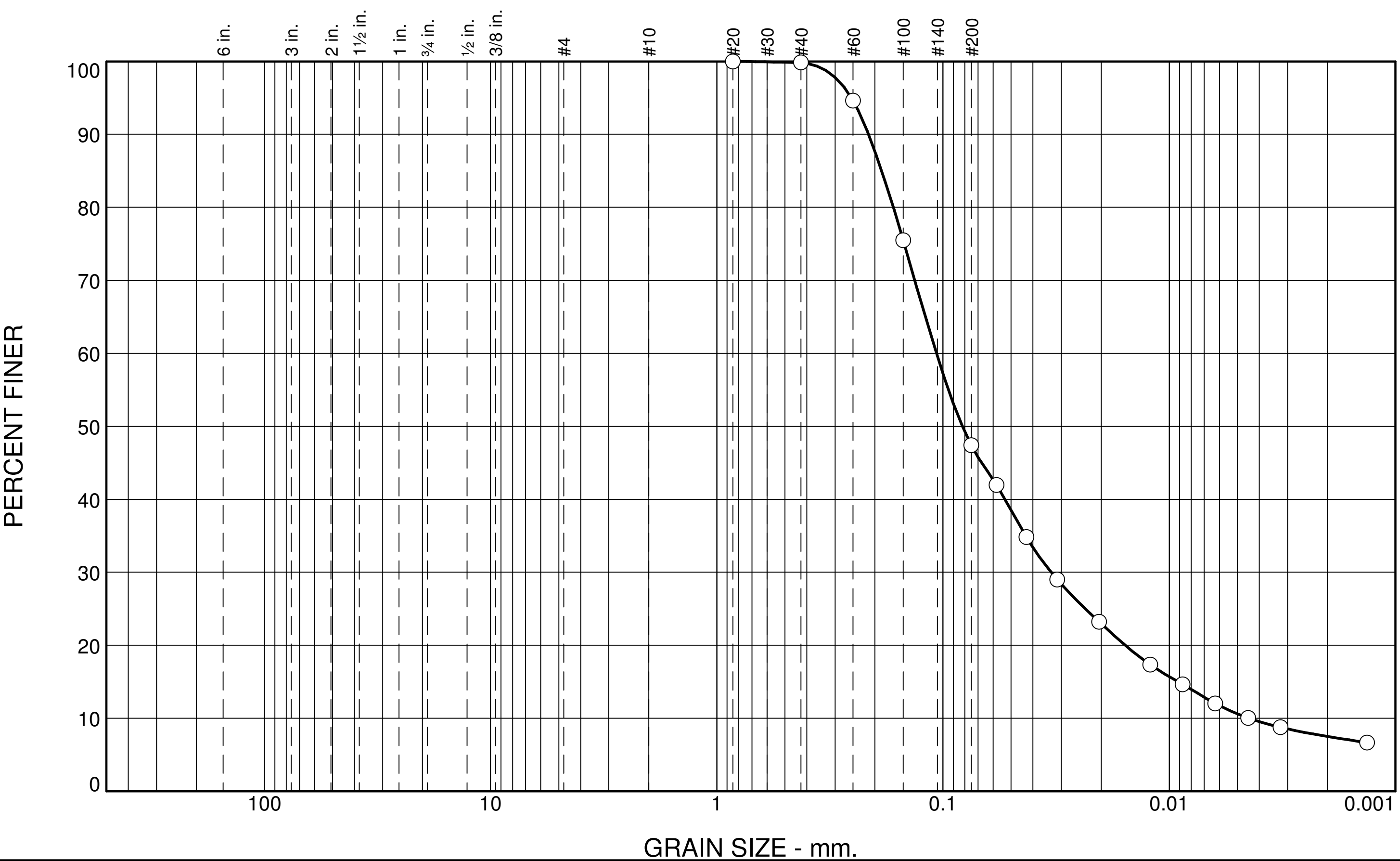
Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD

Project No: DV101-00336/08   **Figure**

Tested By: EAG   **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	52.5	39.9	7.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#20	100.0		
#40	99.9		
#60	94.6		
#100	75.5		
#200	47.4		
0.0580 mm.	41.9		
0.0428 mm.	34.8		
0.0313 mm.	29.0		
0.0204 mm.	23.2		
0.0121 mm.	17.4		
0.0087 mm.	14.7		
0.0063 mm.	12.0		
0.0045 mm.	10.0		
0.0032 mm.	8.8		
0.0013 mm.	6.7		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2134 D_{85}= 0.1867 D_{60}= 0.1068
D_{50}= 0.0821 D_{30}= 0.0332 D_{15}= 0.0091
D_{10}= 0.0044 C_u= 24.07 C_c= 2.33

Classification

USCS= SM AASHTO= A-4(0)

Remarks

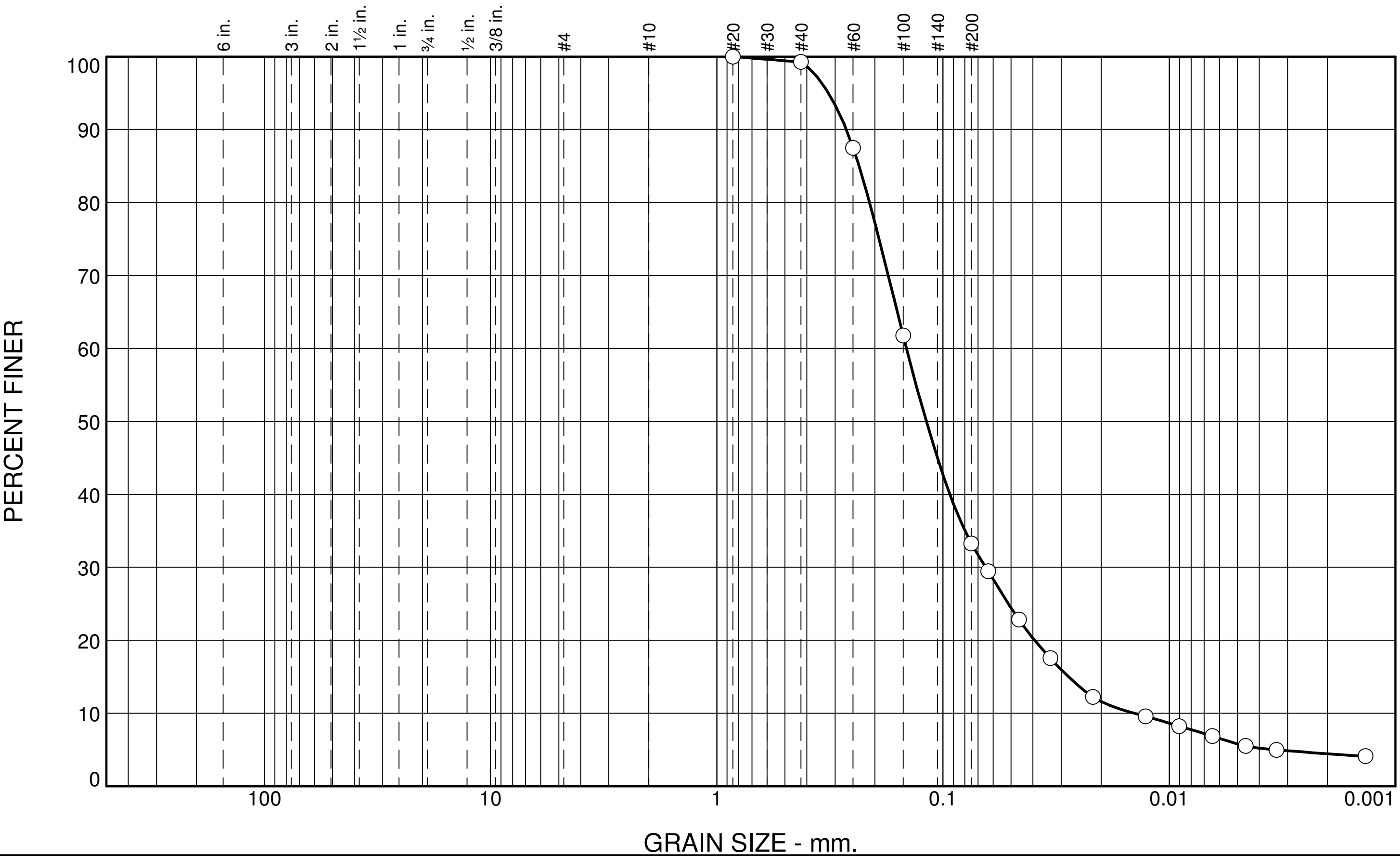
Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-29 **Elev./Depth:** 50'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	66.0	28.8	4.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#20	100.0		
#40	99.3		
#60	87.5		
#100	61.8		
#200	33.3		
0.0632 mm.	29.5		
0.0462 mm.	22.8		
0.0335 mm.	17.6		
0.0217 mm.	12.3		
0.0127 mm.	9.6		
0.0090 mm.	8.2		
0.0064 mm.	6.9		
0.0046 mm.	5.5		
0.0034 mm.	5.0		
0.0014 mm.	4.1		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2678 D_{85}= 0.2353 D_{60}= 0.1450
D_{50}= 0.1185 D_{30}= 0.0648 D_{15}= 0.0279
D_{10}= 0.0143 C_u= 10.16 C_c= 2.03

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-29 **Elev./Depth:** 25'

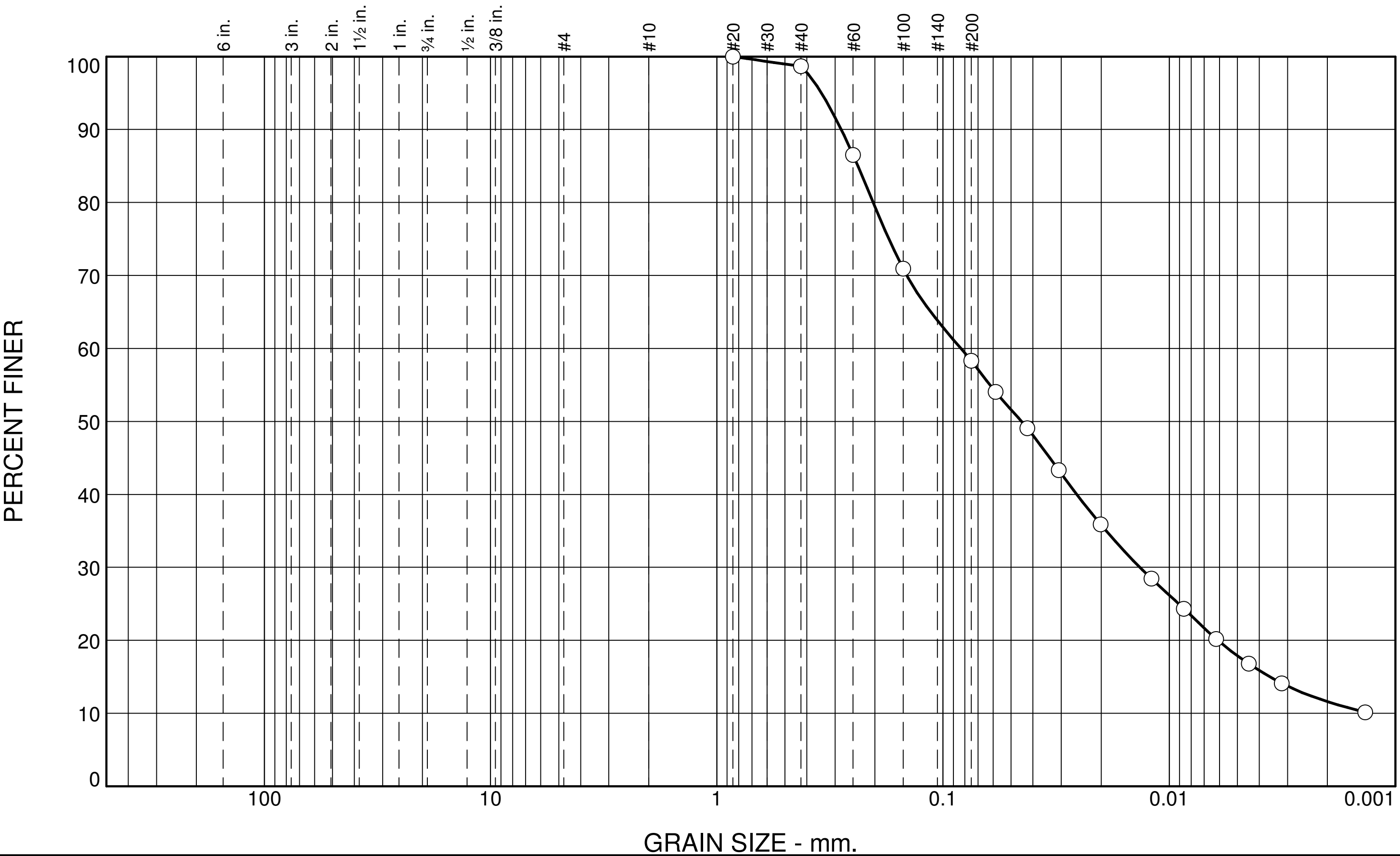
Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD

Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:**

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.3	40.4	46.7	11.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#20	100.0		
#40	98.7		
#60	86.5		
#100	70.9		
#200	58.3		
0.0585 mm.	54.0		
0.0424 mm.	49.1		
0.0308 mm.	43.3		
0.0201 mm.	35.9		
0.0120 mm.	28.5		
0.0086 mm.	24.3		
0.0062 mm.	20.2		
0.0044 mm.	16.8		
0.0032 mm.	14.1		
0.0014 mm.	10.1		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= 22 PI= NP

Coefficients

D_{90}= 0.2817 D_{85}= 0.2380 D_{60}= 0.0833
D_{50}= 0.0449 D_{30}= 0.0135 D_{15}= 0.0036
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

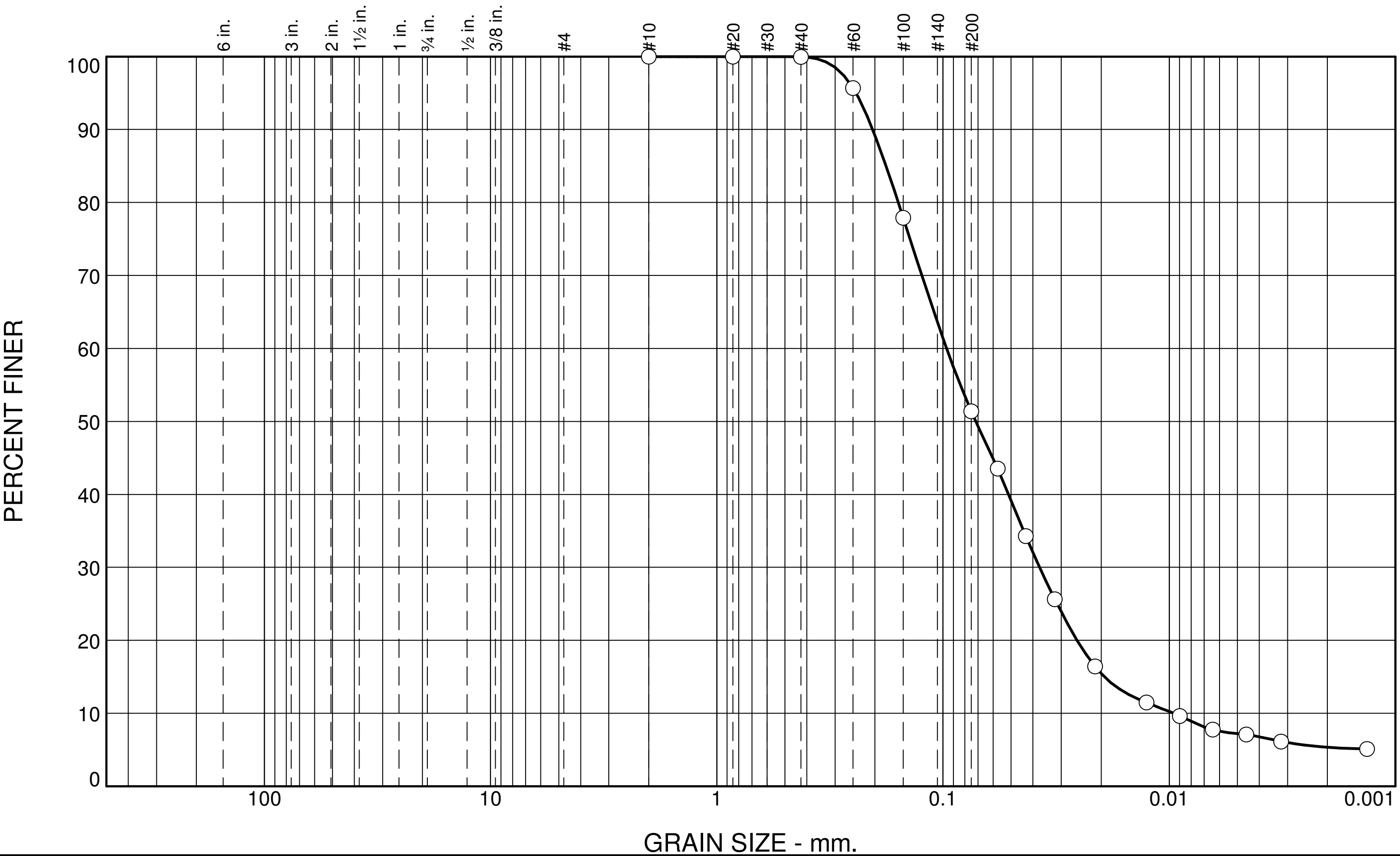
Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-30 **Elev./Depth:** 120'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	48.6	46.0	5.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	100.0		
#60	95.7		
#100	77.9		
#200	51.4		
0.0573 mm.	43.5		
0.0431 mm.	34.3		
0.0320 mm.	25.6		
0.0213 mm.	16.4		
0.0126 mm.	11.5		
0.0090 mm.	9.6		
0.0064 mm.	7.8		
0.0046 mm.	7.1		
0.0032 mm.	6.1		
0.0013 mm.	5.1		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2046 D_{85}= 0.1786 D_{60}= 0.0963
D_{50}= 0.0717 D_{30}= 0.0374 D_{15}= 0.0193
D_{10}= 0.0096 C_u= 10.06 C_c= 1.52

Classification

USCS= ML AASHTO= A-4(0)

Remarks

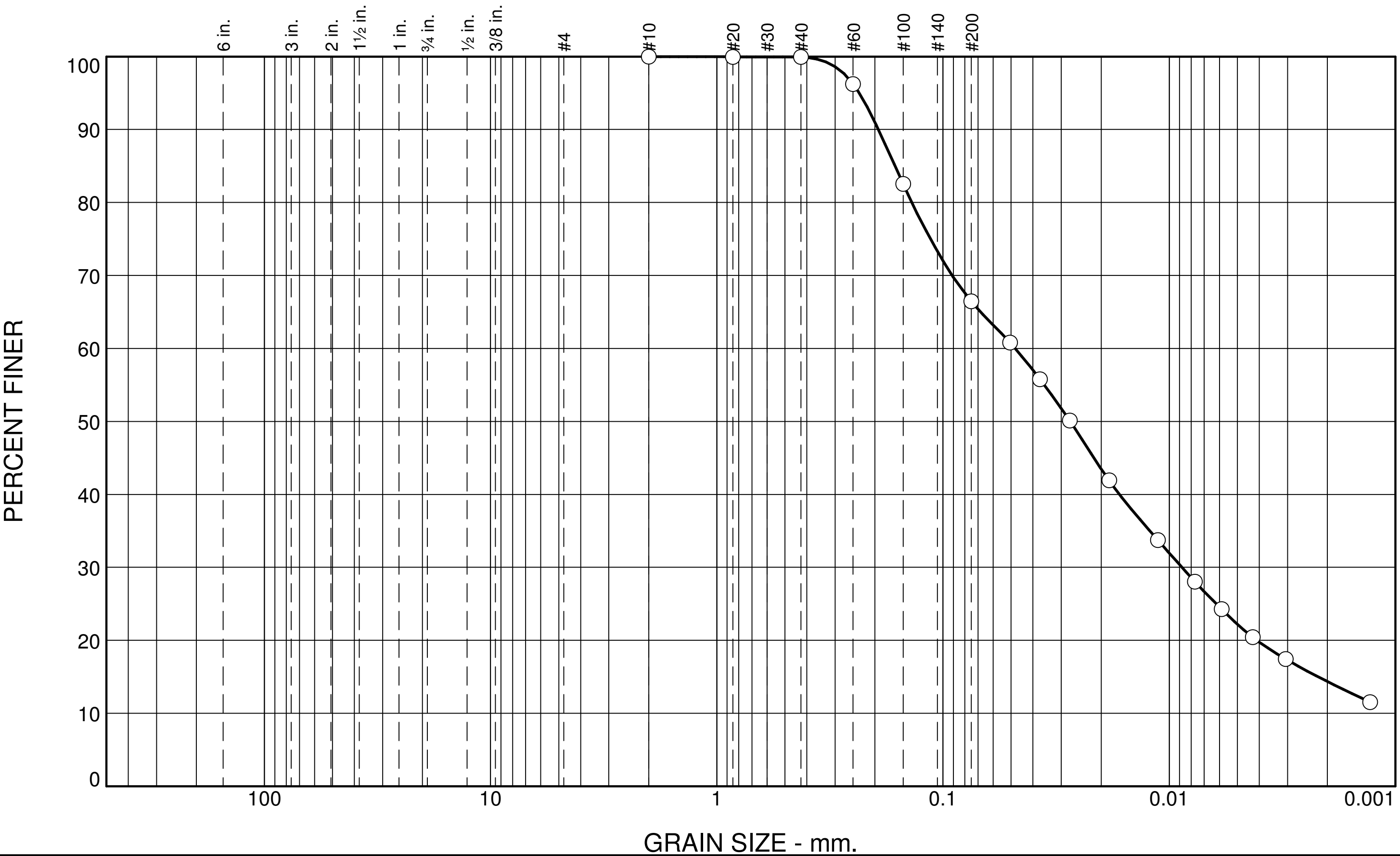
Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-30 **Elev./Depth:** 20'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	33.4	52.1	14.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#60	96.2		
#100	82.5		
#200	66.5		
0.0505 mm.	60.8		
0.0373 mm.	55.8		
0.0275 mm.	50.1		
0.0184 mm.	41.9		
0.0112 mm.	33.7		
0.0077 mm.	28.0		
0.0059 mm.	24.3		
0.0043 mm.	20.4		
0.0031 mm.	17.4		
0.0013 mm.	11.5		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= 24 PI= NP

Coefficients

D_{90}= 0.1929 D_{85}= 0.1630 D_{60}= 0.0479
D_{50}= 0.0274 D_{30}= 0.0088 D_{15}= 0.0022
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-30 **Elev./Depth:** 180'

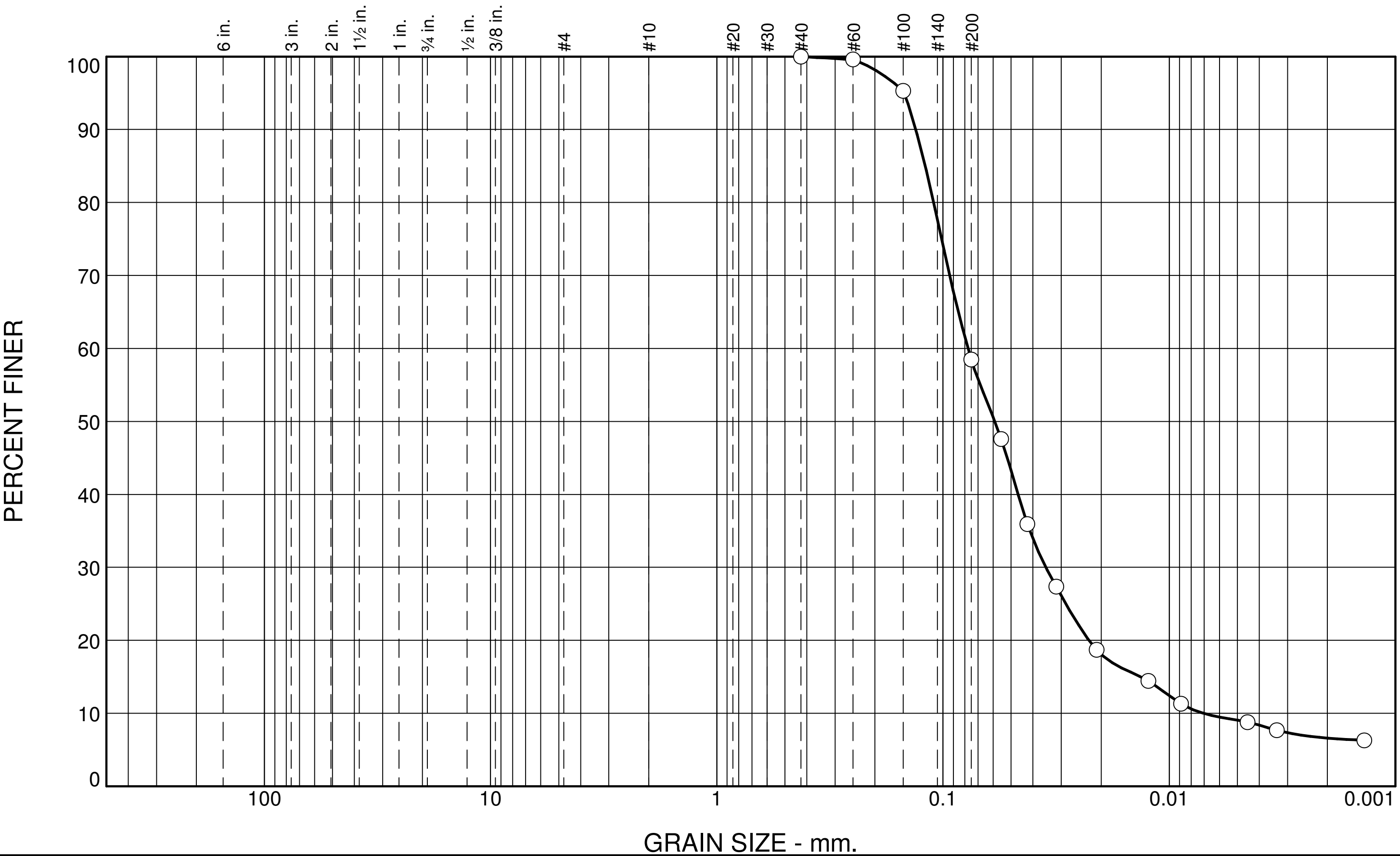
Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD

Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	41.5	51.9	6.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#40	100.0		
#60	99.6		
#100	95.3		
#200	58.5		
0.0553 mm.	47.6		
0.0423 mm.	35.9		
0.0315 mm.	27.3		
0.0209 mm.	18.7		
0.0123 mm.	14.4		
0.0089 mm.	11.3		
0.0045 mm.	8.8		
0.0033 mm.	7.7		
0.0014 mm.	6.3		

* (no specification provided)

Soil Description

sandy silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.1318 D_{85}= 0.1199 D_{60}= 0.0776
D_{50}= 0.0590 D_{30}= 0.0351 D_{15}= 0.0134
D_{10}= 0.0071 C_u= 10.99 C_c= 2.25

Classification

USCS= ML AASHTO= A-4(0)

Remarks

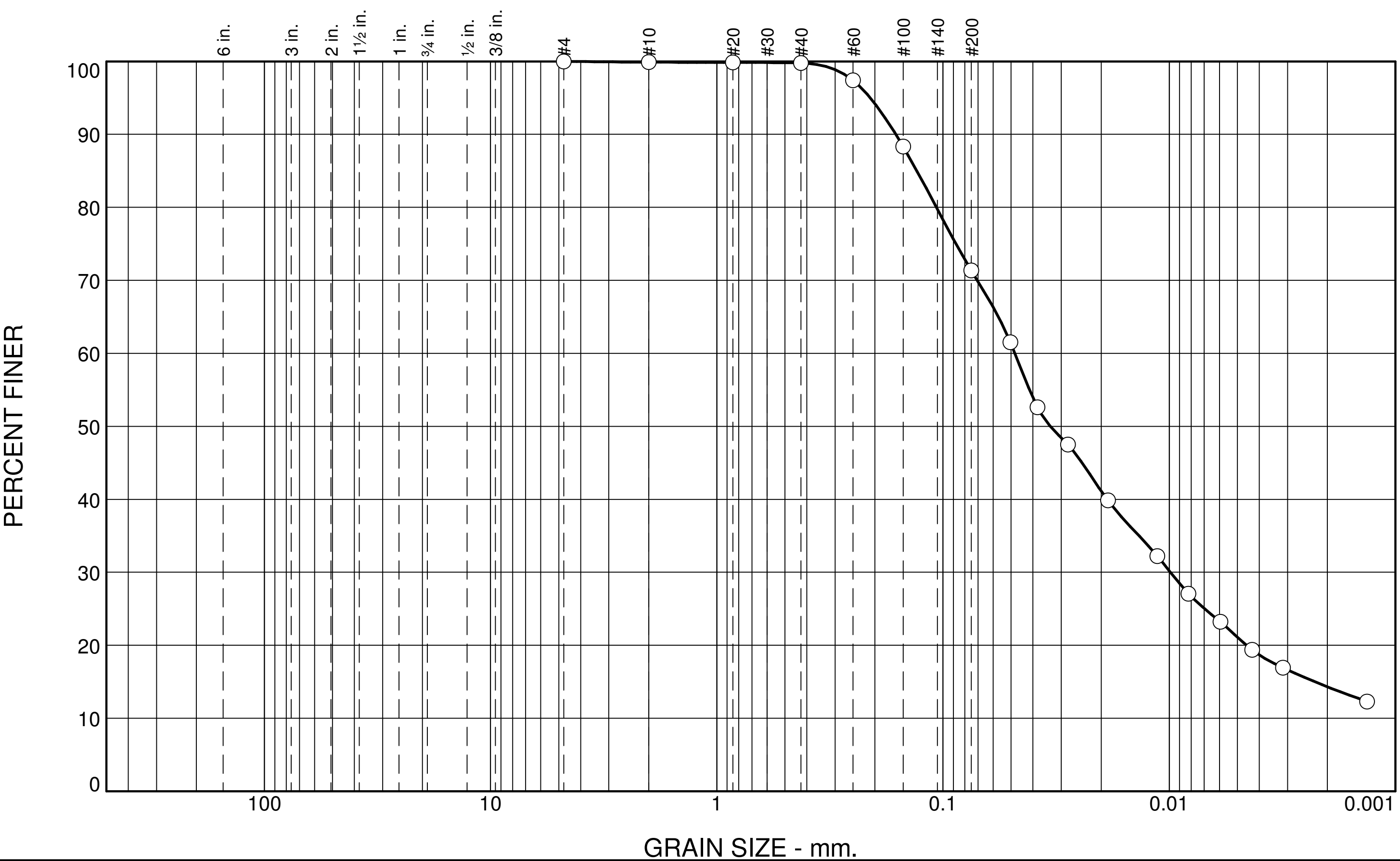
Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-32 **Elev./Depth:** 120'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.1	28.5	57.0	14.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.9		
#40	99.8		
#60	97.4		
#100	88.3		
#200	71.3		
0.0503 mm.	61.5		
0.0382 mm.	52.6		
0.0281 mm.	47.5		
0.0187 mm.	39.9		
0.0113 mm.	32.2		
0.0082 mm.	27.1		
0.0059 mm.	23.2		
0.0043 mm.	19.4		
0.0031 mm.	16.9		
0.0013 mm.	12.3		

* (no specification provided)

Soil Description

silt with sand

Atterberg Limits

PL= 23 LL= 26 PI= 3

Coefficients

D_{90}= 0.1617 D_{85}= 0.1305 D_{60}= 0.0481
D_{50}= 0.0335 D_{30}= 0.0099 D_{15}= 0.0023
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(1)

Remarks

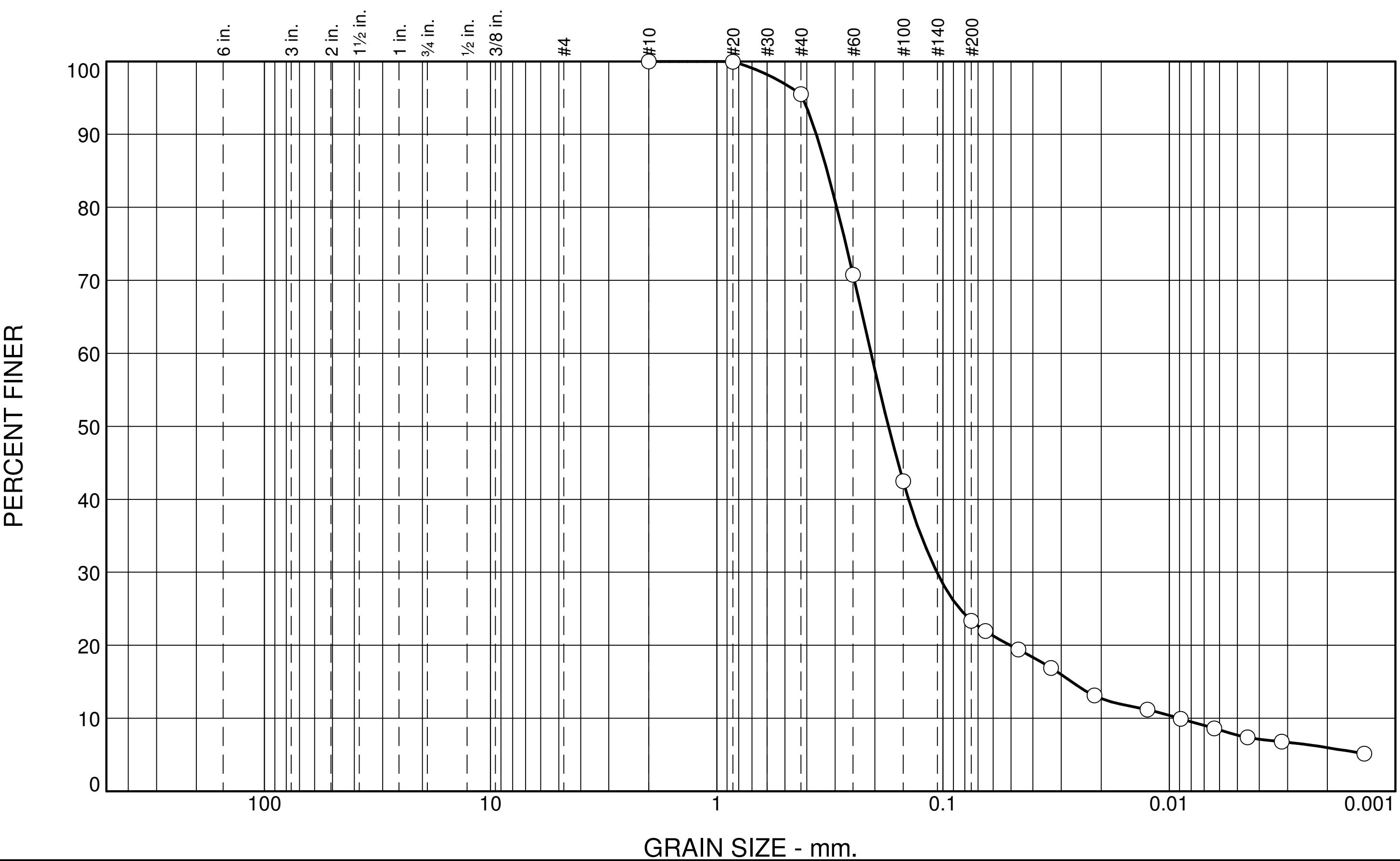
Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-32 **Elev./Depth:** 220'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:**

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	4.5	72.1	17.4	6.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	95.5		
#60	70.8		
#100	42.5		
#200	23.4		
0.0648 mm.	21.9		
0.0464 mm.	19.4		
0.0333 mm.	16.9		
0.0214 mm.	13.1		
0.0125 mm.	11.2		
0.0089 mm.	9.9		
0.0063 mm.	8.6		
0.0045 mm.	7.4		
0.0032 mm.	6.8		
0.0014 mm.	5.1		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.3631 D_{85}= 0.3250 D_{60}= 0.2080
D_{50}= 0.1742 D_{30}= 0.1063 D_{15}= 0.0270
D_{10}= 0.0091 C_u= 22.94 C_c= 6.00

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

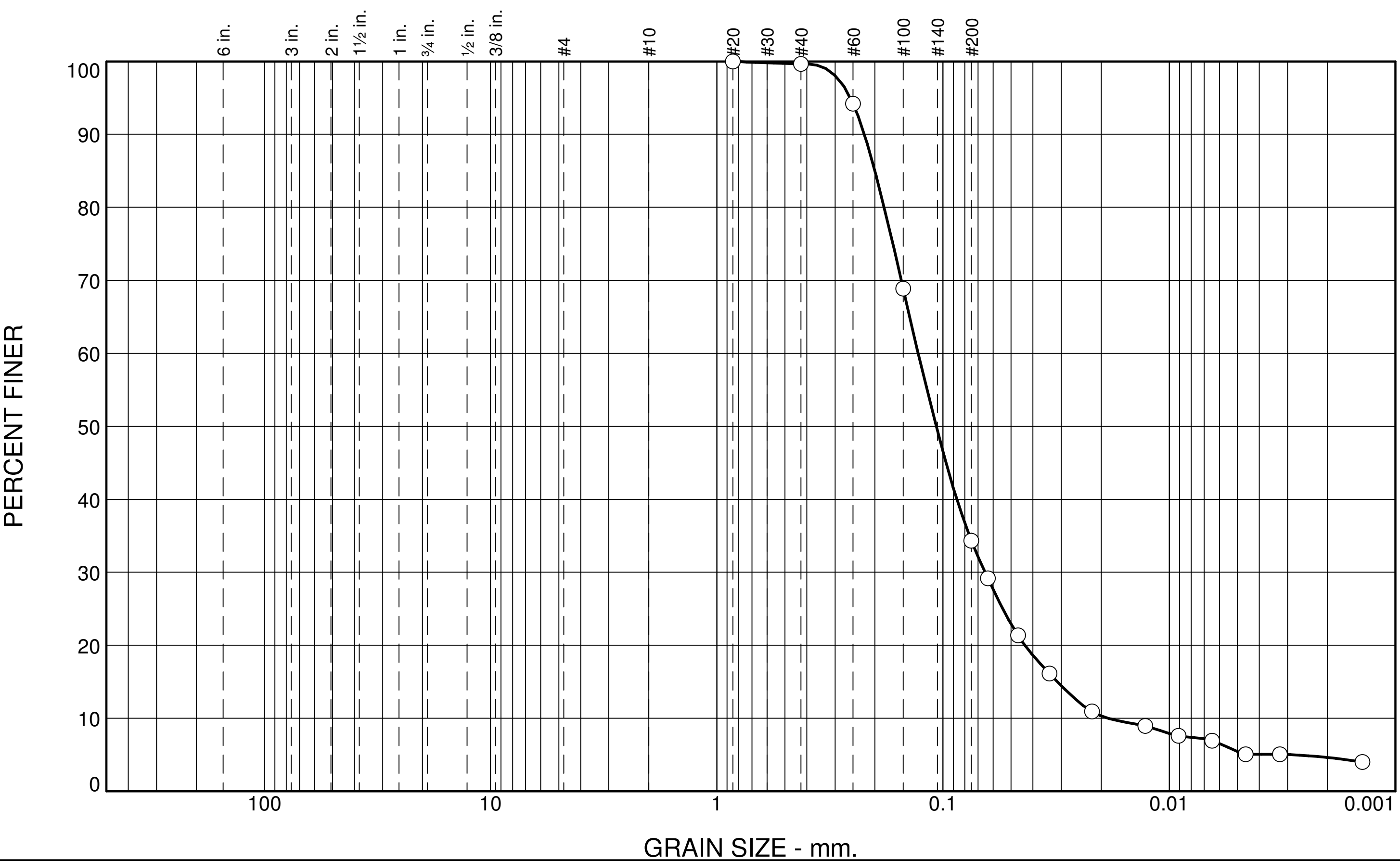
Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-32 **Elev./Depth:** 35'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Particle Size Distribution Report ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	65.4	29.7	4.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#20	100.0		
#40	99.7		
#60	94.2		
#100	68.9		
#200	34.3		
0.0633 mm.	29.2		
0.0466 mm.	21.4		
0.0338 mm.	16.1		
0.0219 mm.	10.9		
0.0128 mm.	8.9		
0.0091 mm.	7.6		
0.0065 mm.	6.9		
0.0046 mm.	5.1		
0.0032 mm.	5.1		
0.0014 mm.	4.0		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.2228 D_{85}= 0.2001 D_{60}= 0.1287
D_{50}= 0.1071 D_{30}= 0.0652 D_{15}= 0.0312
D_{10}= 0.0186 C_u= 6.90 C_c= 1.77

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample No.: **Source of Sample:** **Date:** 4/12/17
Location: CPT-32 **Elev./Depth:** 70'

Knight Piésold CONSULTING

Client: KP Denver
Project: Fish Creek East WRD
Project No: DV101-00336/08 **Figure**

Tested By: EAG **Checked By:** JDB

Appendix C-2

Tailing Specific Gravity Testing

Knight Piésold CONSULTING

Specific Gravity - Soil
ASTM D 854

Project	Fish Creek	**Project No.**	DV101-00336/08
Date Staged	4/19/2017	**Act. Code**	2020
Date Completed	4/25/2017	**Lab No.**	L2017-032
Tested By	EAG/JMT	**Checked By**	

Sample No.	CPT-23 @ 30'-85'		CPT-23 @ 100'-150'		CPT-23 @ 175'-250'		CPT-24 @ 30'-100'		CPT-24 @ 120'-176'	
Sample Prep. (Wet or Dry)	Dry		Dry		Dry		Dry		Dry	
Flask No.	14G	14F	5	14B	1	14A	14H	14L	6	14F
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	35.41	38.07	44.91	42.06	37.51	49.39	38.64	40.04	34.96	35.32
4) Calibrated Wt. of Flask + Water	337.15	340.67	352.48	338.59	349.10	335.38	337.66	337.97	342.31	340.75
5) #3 + #4	372.56	378.74	397.39	380.65	386.61	384.77	376.30	378.01	377.27	376.07
6) Wt. of Flask + Water + Soil	359.53	364.69	380.71	365.04	372.77	366.49	362.02	363.25	364.53	363.18
7) Volume of Soil (5 - 6)	13.03	14.05	16.68	15.61	13.84	18.28	14.28	14.76	12.74	12.89
8) Test Temperature, deg. C	20.5	20.4	20.2	20.5	20.3	20.4	20.3	20.5	19	18.8
9) Temperature Correction, k	0.999890	0.999912	0.999956	0.999890	0.999934	0.999912	0.999934	0.999890	1.000200	1.000240
10) Specific Gravity ((3 / 7) * k)	2.717	2.709	2.692	2.694	2.710	2.702	2.706	2.712	2.745	2.741
Reported Average, G_s @ 20 deg.C	2.713		2.693		2.706		2.709		2.743	
Tare	16	5	12	10	4	11	20	3	5	16
Dry Soil + tare, g	428.95	413.12	440.55	414.07	424.65	442.25	433.9	442.52	410.05	428.88
Tare, g	393.54	375.05	395.64	372.01	387.14	392.86	395.26	402.48	375.09	393.56

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded, by the density of water at 20 deg. C.

Knight Piésold CONSULTING

Specific Gravity - Soil
ASTM D 854

Project	Fish Creek	**Project No.**	DV101-00336/08
Date Staged	4/19/2017	**Act. Code**	2020
Date Completed	4/25/2017	**Lab No.**	L2017-032
Tested By	EAG/JMT	**Checked By**	

Sample No.	CPT-25 @ 0'-120'		CPT-25 @ 120'-160'		CPT-26 @ 0'-80'		CPT-26 @ 100'-140'		CPT-26 @ 160'-180'	
Sample Prep. (Wet or Dry)	Dry		Dry		Dry		Dry		Dry	
Flask No.	14D	14A	10	14C	14C	4	14L	14H	14E	1
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	35.94	34.50	35.18	34.68	35.42	35.46	33.94	35.77	35.51	35.12
4) Calibrated Wt. of Flask + Water	337.61	335.47	343.88	336.64	336.62	365.72	338.06	337.73	338.07	349.19
5) #3 + #4	373.55	369.97	379.06	371.32	372.04	401.18	372.00	373.50	373.58	384.31
6) Wt. of Flask + Water + Soil	360.39	357.18	366.07	358.71	359.16	387.97	359.60	360.37	360.44	371.29
7) Volume of Soil (5 - 6)	13.16	12.79	12.99	12.61	12.88	13.21	12.40	13.13	13.14	13.02
8) Test Temperature, deg. C	18.7	18.7	18.7	18.8	19.1	19.1	18.7	18.9	18.9	18.5
9) Temperature Correction, k	1.000260	1.000260	1.000260	1.000240	1.000180	1.000180	1.000260	1.000220	1.000220	1.000301
10) Specific Gravity ((3 / 7) * k)	2.732	2.698	2.709	2.751	2.750	2.685	2.738	2.725	2.703	2.698
Reported Average, G_s @ 20 deg.C	2.715		2.730		2.718		2.731		2.701	
Tare	2	60	17	15	11	4	1	7	10	8
Dry Soil + tare, g	428.9	436.43	430.27	428.09	428.33	422.65	428.36	428.71	438.41	427.31
Tare, g	392.96	401.93	395.09	393.41	392.91	387.19	394.42	392.94	402.9	392.19

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded, by the density of water at 20 deg. C.

Knight Piésold CONSULTING

Specific Gravity - Soil
ASTM D 854

Project	Fish Creek	**Project No.**	DV101-00336/08
Date Staged	4/19/2017	**Act. Code**	2020
Date Completed	4/25/2017	**Lab No.**	L2017-032
Tested By	EAG/JMT	**Checked By**	

Sample No.	CPT-27 @ 0'-103'		CPT-27 @ 125'-145'		CPT-28 @ 30'-100'		CPT-28 @ 120'-180'		CPT-28 @ 200'-240'	
Sample Prep. (Wet or Dry)	DRY		Dry		Dry		Dry		Dry	
Flask No.	14K	4	14E	1	14K	14A	14L	10	10	14K
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	35.89	36.56	29.34	35.50	34.34	34.56	35.01	35.63	35.47	35.25
4) Calibrated Wt. of Flask + Water	338.37	365.76	338.00	349.14	338.37	335.45	338.03	343.85	343.88	338.38
5) #3 + #4	374.26	402.32	367.34	384.64	372.71	370.01	373.04	379.48	379.35	373.63
6) Wt. of Flask + Water + Soil	360.90	388.76	356.66	371.61	359.77	357.45	360.45	366.43	366.14	360.65
7) Volume of Soil (5 - 6)	13.36	13.56	10.68	13.03	12.94	12.56	12.59	13.05	13.21	12.98
8) Test Temperature, deg. C	18.9	18.3	19.5	19.5	18.9	19	19.3	19.3	18.7	18.7
9) Temperature Correction, k	1.000220	1.000337	1.000100	1.000100	1.000220	1.000200	1.000140	1.000140	1.000260	1.000260
10) Specific Gravity ((3 / 7) * k)	2.687	2.697	2.747	2.725	2.655	2.752	2.781	2.731	2.686	2.716
Reported Average, G_s @ 20 deg.C	2.692		2.736		2.704		2.756		2.701	
Tare	6	13	I	14	3	10	20	12	8	10
Dry Soil + tare, g	411.72	439.48	189.6	438.79	436.86	406.62	430.32	431.49	427.68	438.15
Tare, g	375.83	402.92	160.26	403.29	402.52	372.06	395.31	395.86	392.21	402.9

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded, by the density of water at 20 deg. C.

Knight Piésold CONSULTING

Specific Gravity - Soil
ASTM D 854

Project	Fish Creek	**Project No.**	DV101-00336/08
Date Staged	4/19/2017	**Act. Code**	2020
Date Completed	4/25/2017	**Lab No.**	L2017-032
Tested By	EAG/JMT	**Checked By**	

Sample No.	CPT-29 @ 25'-100'		CPT-29 @ 100'-156'		CPT-30 @ 0'-80'		CPT-30 @ 90'-180'		CPT-32 @ 35'-175'	
Sample Prep. (Wet or Dry)	DRY		Dry		Dry		Dry		Dry	
Flask No.	6	14A	4	14C	14F	14L	14H	14D		1
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	35.36	35.16	34.59	35.55	35.20	35.05	35.32	35.66		35.42
4) Calibrated Wt. of Flask + Water	342.34	335.48	365.78	336.65	340.76	338.07	337.76	337.63		349.19
5) #3 + #4	377.70	370.64	400.37	372.20	375.96	373.12	373.08	373.29		384.61
6) Wt. of Flask + Water + Soil	364.79	357.81	387.55	359.08	363.00	360.24	360.08	360.23		371.71
7) Volume of Soil (5 - 6)	12.91	12.83	12.82	13.12	12.96	12.88	13.00	13.06		12.90
8) Test Temperature, deg. C	18.4	18.5	18.5	18.5	18.6	18.5	18.3	18.3		18.5
9) Temperature Correction, k	1.000319	1.000301	1.000301	1.000301	1.000280	1.000301	1.000337	1.000337		1.000301
10) Specific Gravity ((3 / 7) * k)	2.740	2.741	2.699	2.710	2.717	2.722	2.718	2.731		2.747
Reported Average, G_s @ 20 deg.C	2.741		2.705		2.719		2.725		2.747	
Tare	6	17	7	60	2	15	1	13		4
Dry Soil + tare, g	411.21	430.25	427.5	437.52	428.15	428.46	429.73	438.56		422.59
Tare, g	375.85	395.09	392.91	401.97	392.95	393.41	394.41	402.9		387.17

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded, by the density of water at 20 deg. C.

Knight Piésold CONSULTING

Specific Gravity - Soil
ASTM D 854

Project	Fish Creek	**Project No.**	DV101-00336/08
Date Staged	4/19/2017	**Act. Code**	2020
Date Completed	4/25/2017	**Lab No.**	L2017-032
Tested By	EAG/JMT	**Checked By**	

Sample No.	CPT-32 @ 200'-246'		CPT-32 @ 70'-90'							
Sample Prep. (Wet or Dry)	DRY		Dry							
Flask No.	14B	14E	14I	5						
1) Wt. of Flask + Soil										
2) Wt. of Flask										
3) Wt. of Soil (1-2)	35.82	35.20	36.04	35.08						
4) Calibrated Wt. of Flask + Water	338.69	338.09	337.16	352.56						
5) #3 + #4	374.51	373.29	373.20	387.64						
6) Wt. of Flask + Water + Soil	361.51	360.31	359.84	374.75						
7) Volume of Soil (5 - 6)	13.00	12.98	13.36	12.89						
8) Test Temperature, deg. C	18.5	18.6	18.6	18.6						
9) Temperature Correction, k	1.000301	1.000280	1.000280	1.000280						
10) Specific Gravity ((3 / 7) * k)	2.756	2.713	2.698	2.722						
Reported Average, G_s @ 20 deg.C	2.734		2.710							
Tare	16	11	5	14						
Dry Soil + tare, g	429.36	428.07	410.88	438.35						
Tare, g	393.54	392.87	374.84	403.27						

General Notes: Line 9, k, is determined by dividing the density of water at test temperature recorded, by the density of water at 20 deg. C.

Knight Piésold
CONSULTING

Appendix C-3

Tailing Natural Moisture Content Testing

Knight Piésold
CONSULTING

Moisture Content
ASTM D 2216

Project	Fish Creek East WRD	Project No.	DV108-00336/08
Lab No.	L2017-032	Date of Test	4/19/2017
Tested By	EAG/JT	Checked By	JDB
Drying Conditions:	105 deg C	Method:	Oven

Sample No.		CPT-23	CPT-23	CPT-23	CPT-24	CPT-24
Sample ID						
Depth		30'-85'	100'-150'	175'-250'	30'-100'	120'-176'
Wt. of Water	D , A-B	3941.4	3848.9	3790.3	4136.1	3127.7
Dry Soil, Ws	E , B-C	7606.5	9843.8	10849.0	7080.0	10019.8
Moisture Content, (%)	(D / E) x100	51.8	39.1	34.9	58.4	31.2

Sample No.		CPT-25	CPT-25	CPT-26	CPT-26	CPT-26
Sample ID						
Depth		0'-120'	120'-160'	0'-80'	100'-140'	160'-180'
Wt. of Water	A-B, D	4477.7	2478.7	3264.0	2369.0	1185.4
Dry Soil, Ws	B-C, E	12056.6	3087.3	8553.7	6082.2	4442.1
Moisture Content, (%)	(D / E) x100	37.1	80.3	38.2	39.0	26.7

Sample No.		CPT-27	CPT-27	CPT-28	CPT-28	CPT-28
Sample ID						
Depth		0'-103'	125'-145'	30'-100'	120'-180'	200'-240'
Wt. of Water	A-B, D	4588.5	2664.0	5203.7	3289.5	1915.8
Dry Soil, Ws	B-C, E	11707.9	9704.0	13190.1	7888.5	6777.0
Moisture Content, (%)	(D / E) x100	39.2	27.5	39.5	41.7	28.3

Sample No.		CPT-29	CPT-29	CPT-30	CPT-30	CPT-32
Sample ID						
Depth		25'-100'	100'-156'	0'-80'	90'-180'	35'-175'
Wt. of Water	D , A-B	4597.0	4135.7	3275.6	4165.2	4387.1
Dry Soil, Ws	E , B-C	11914.7	14820.4	9027.5	10079.3	14915.5
Moisture Content, (%)	(D / E) x100	38.6	27.9	36.3	41.3	29.4

Sample No.		CPT-32	CPT-32			
Sample ID						
Depth		200'-246'	70'-90'			
Wt. of Water	A-B, D	2397.8	961.8			
Dry Soil, Ws	B-C, E	4801.3	4191.2			
Moisture Content, (%)	(D / E) x100	49.9	22.9			

Appendix D

Slope Stability Analysis Results

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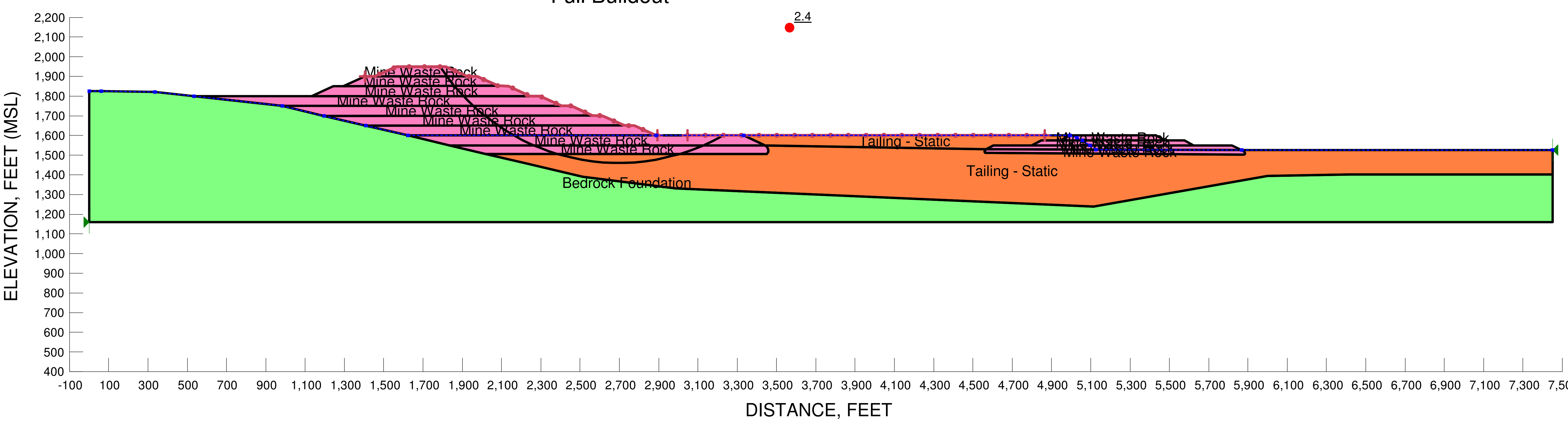
Appendix D-1

Section A Slope Stability Analysis Results

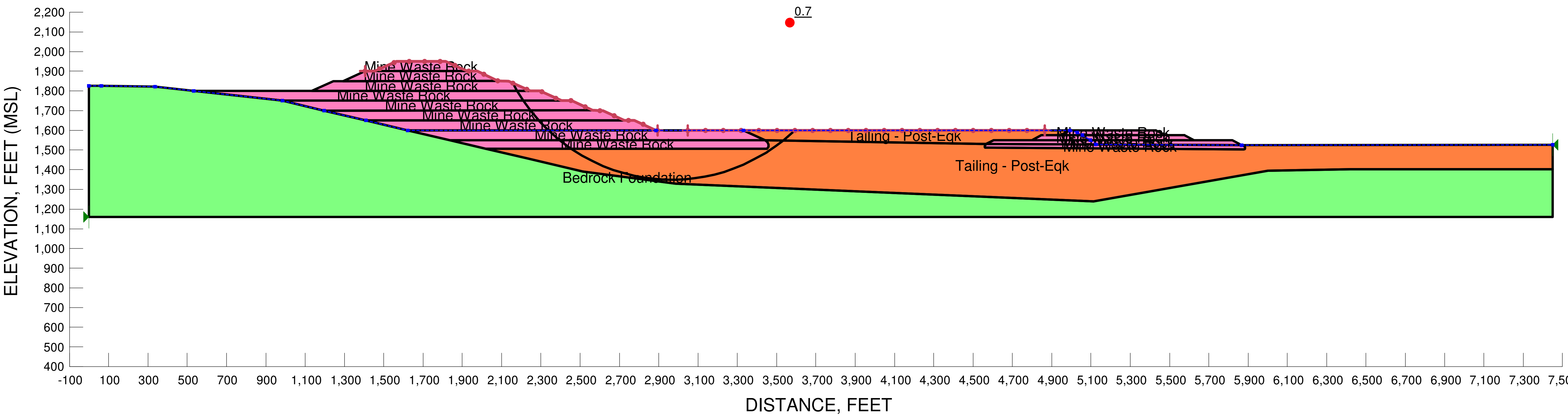
Fish Creek Waste Rock Dump
Section A
Static Slope Stability Analysis

Full Buildout



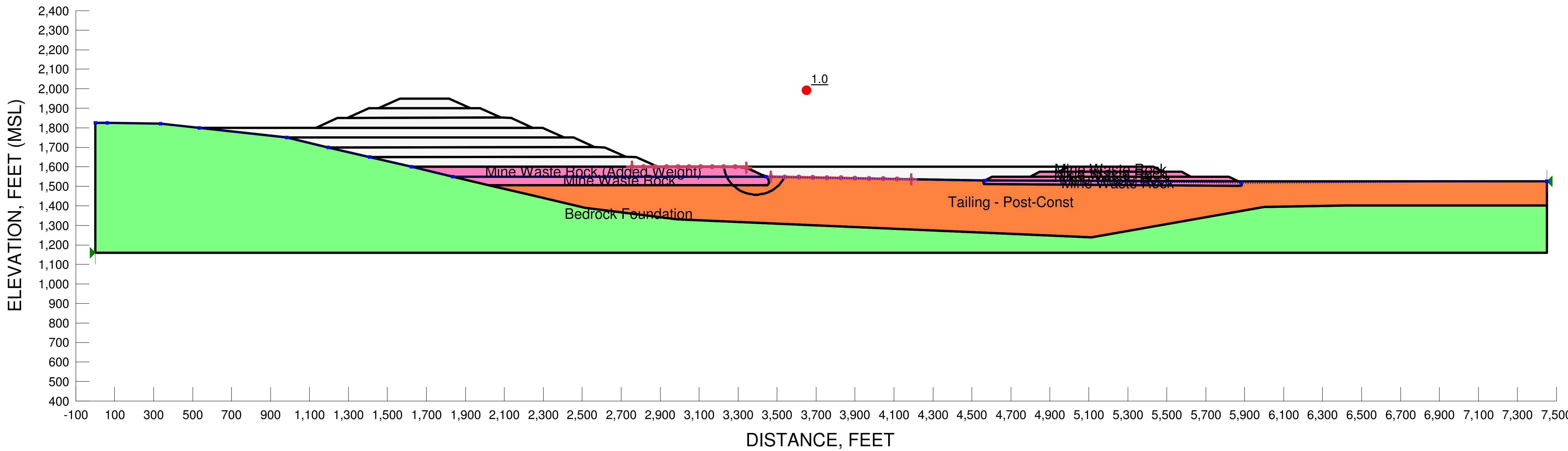
Fish Creek Waste Rock Dump
Section A
Post-Earthquake Slope Stability Analysis

Full Buildout



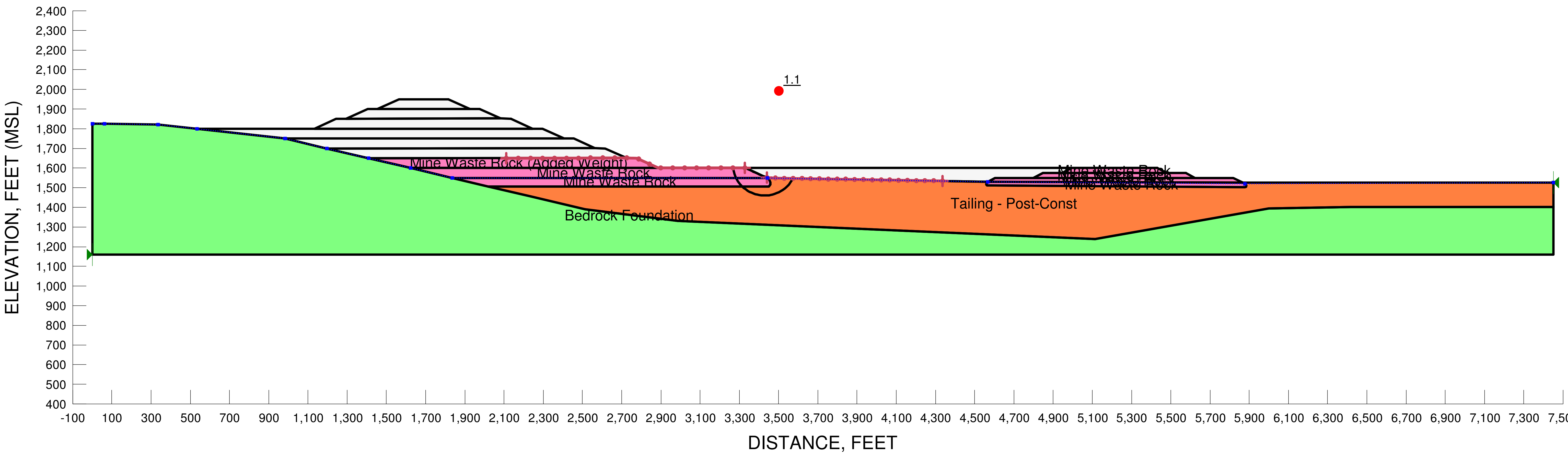
Fish Creek Waste Rock Dump
Section A
Post-Construction Slope Stability Analysis

Lift #1



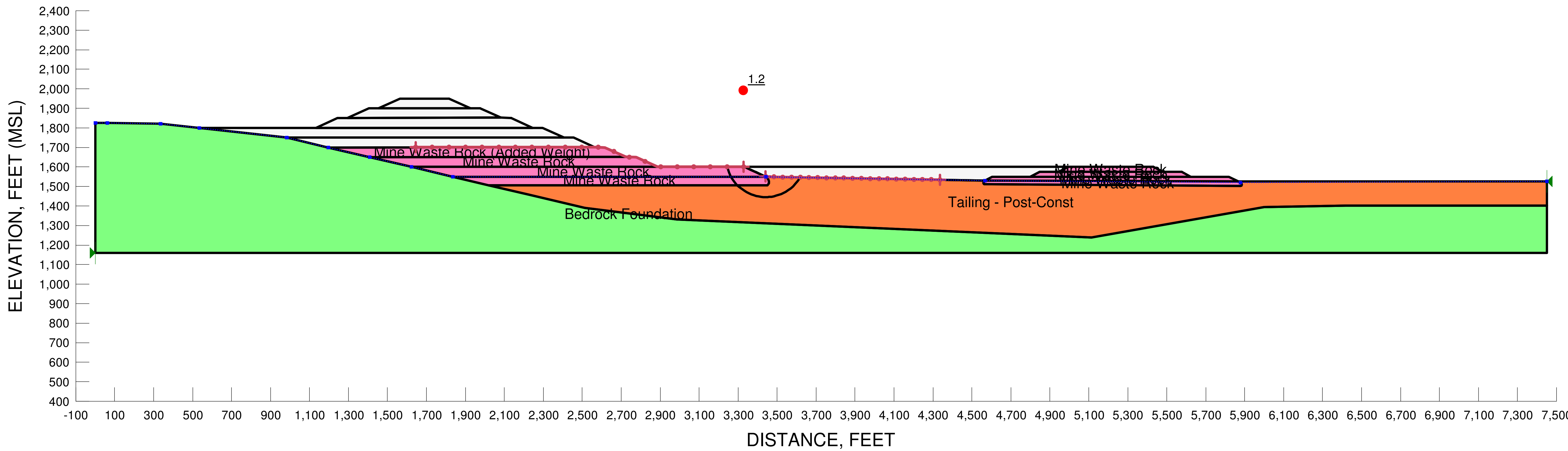
Fish Creek Waste Rock Dump
Section A
Post-Construction Slope Stability Analysis

Lift #2



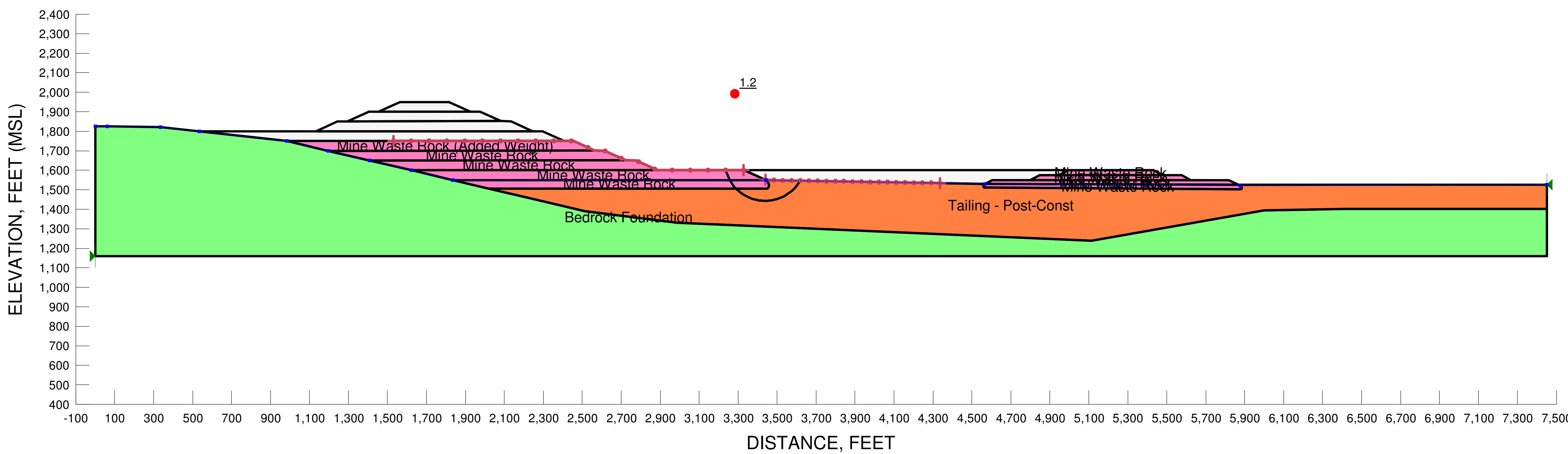
Fish Creek Waste Rock Dump
Section A
Post-Construction Slope Stability Analysis

Lift #3



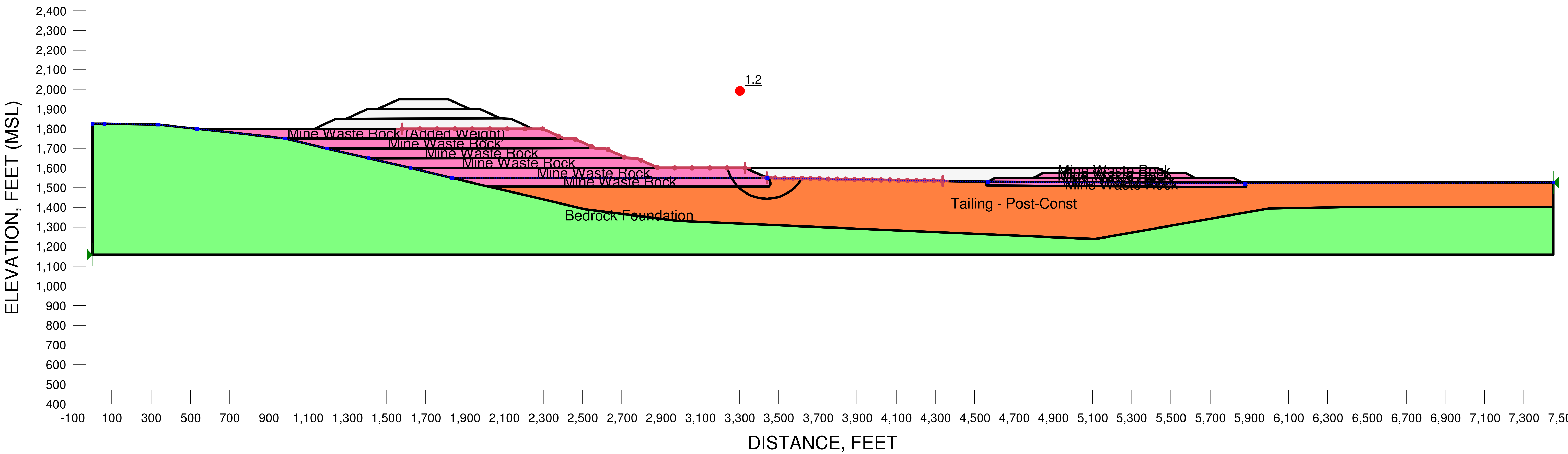
Fish Creek Waste Rock Dump
Section A
Post-Construction Slope Stability Analysis

Lift #4



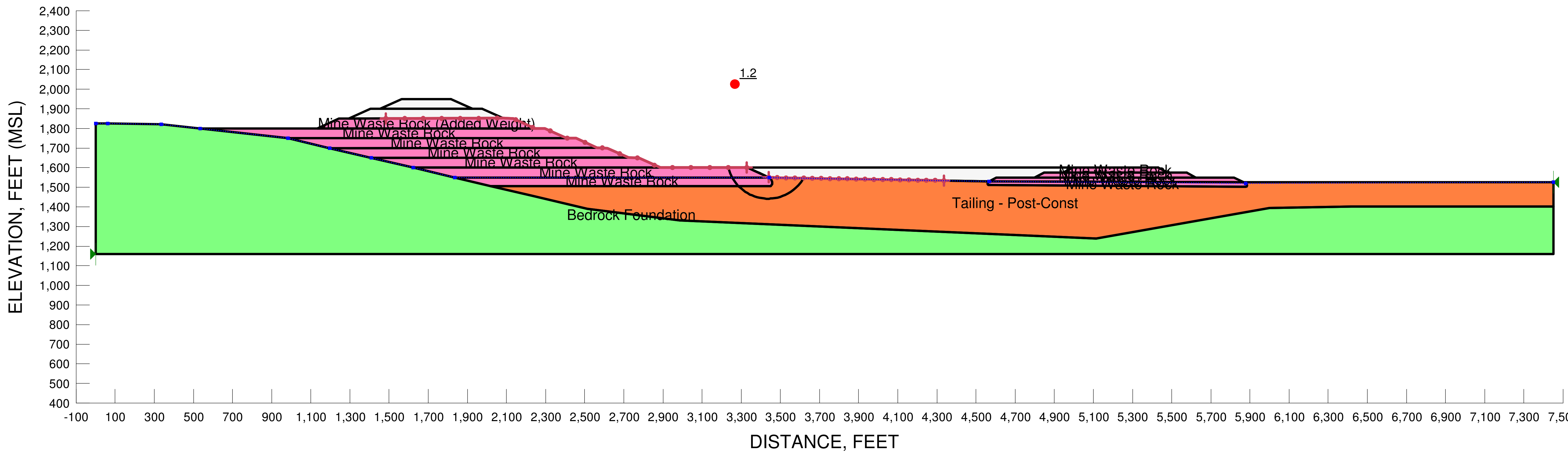
Fish Creek Waste Rock Dump
Section A
Post-Construction Slope Stability Analysis

Lift #5



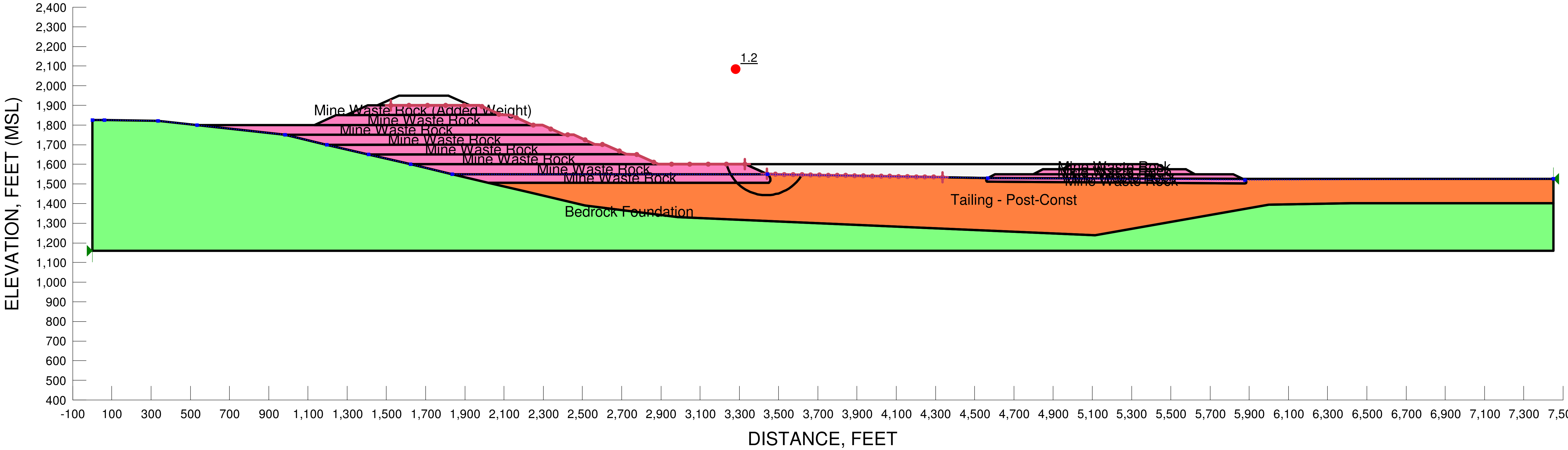
Fish Creek Waste Rock Dump
Section A
Post-Construction Slope Stability Analysis

Lift #6



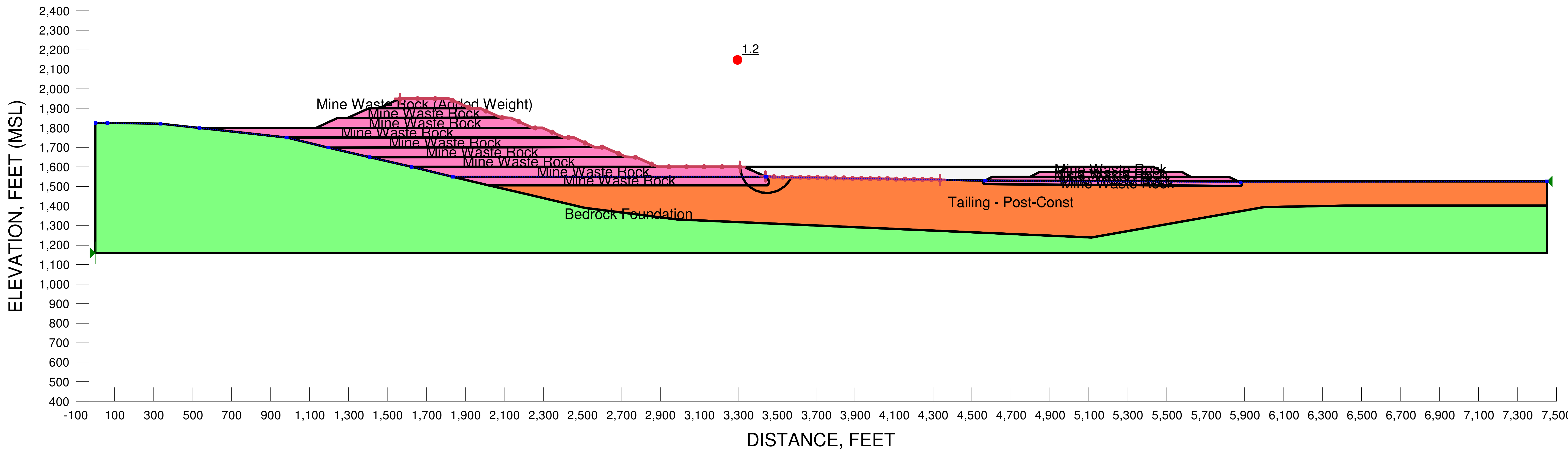
Fish Creek Waste Rock Dump
Section A
Post-Construction Slope Stability Analysis

Lift #7



Fish Creek Waste Rock Dump
Section A
Post-Construction Slope Stability Analysis

Lift #8



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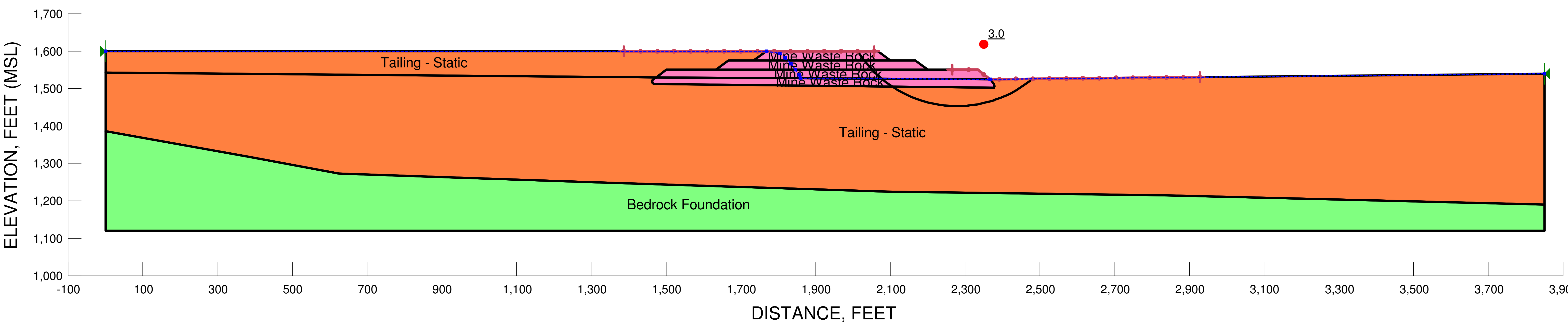
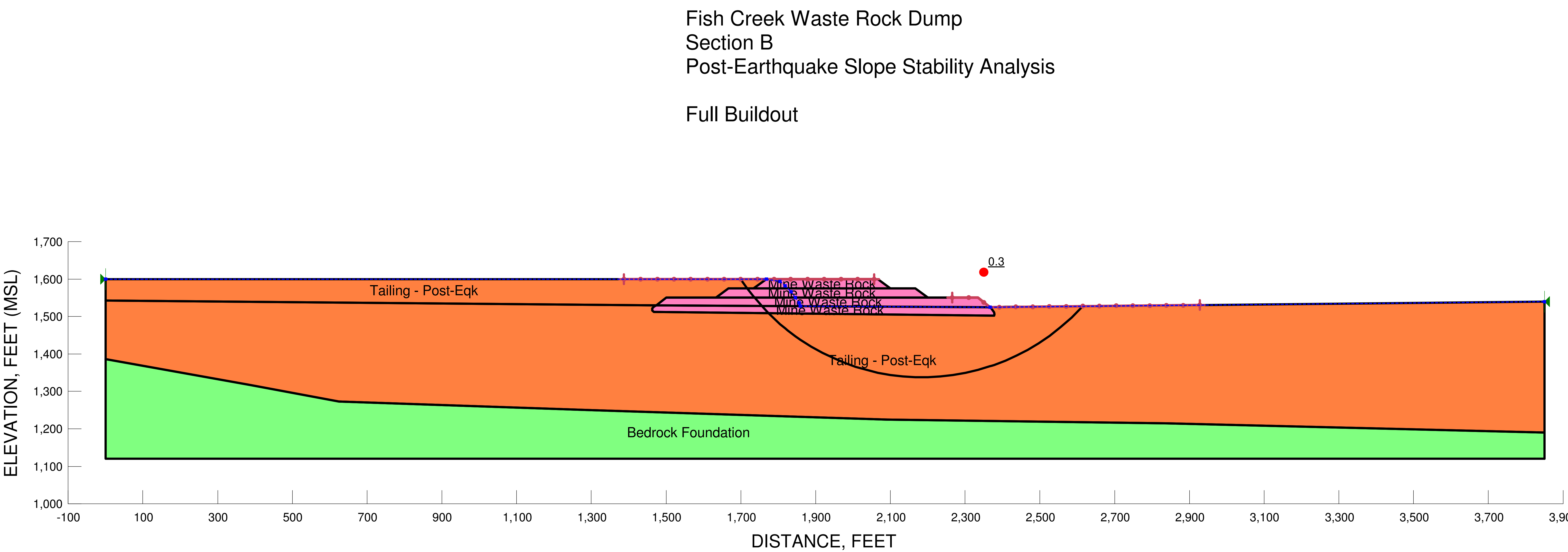
Appendix D-2

Section B Slope Stability Analysis Results

Fish Creek Waste Rock Dump
Section B
Static Slope Stability Analysis

Full Buildout

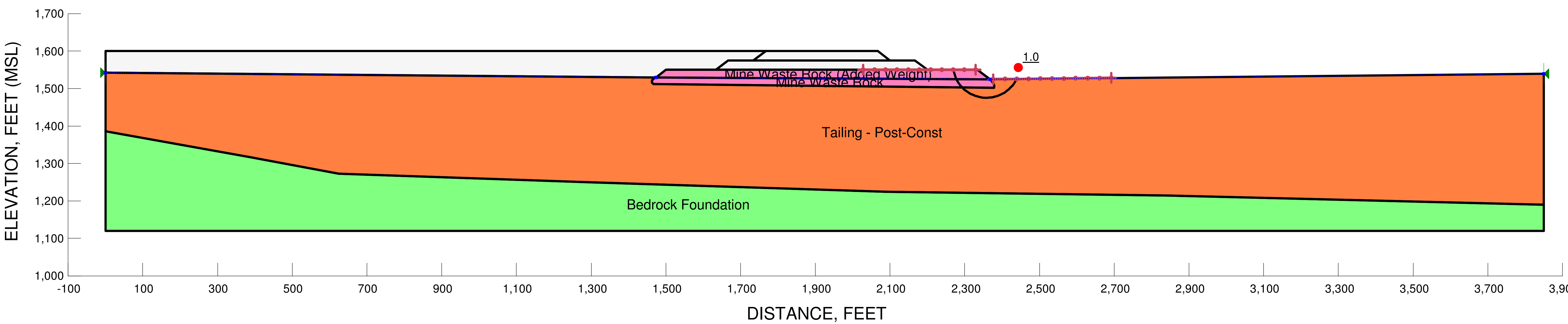




Fish Creek Waste Rock Dump
Section B
Post-Earthquake Slope Stability Analysis
Full Buildout
0.3
Tailing - Post-Eqk
Mine Waste Rock
Mine Waste Rock
Mine Waste Rock
Mine Waste Rock
Tailing - Post-Eqk
Bedrock Foundation
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
ELEVATION, FEET (MSL)
-100
100
300
500
700
900
1,100
1,300
1,500
1,700
1,900
2,100
2,300
2,500
2,700
2,900
3,100
3,300
3,500
3,700
3,900
DISTANCE, FEET

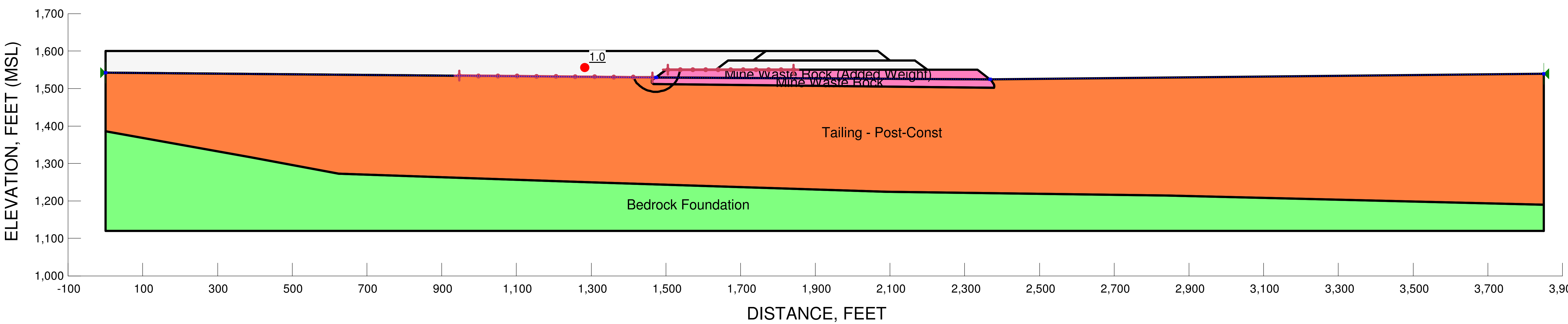
Fish Creek Waste Rock Dump
Section B
Downstream Post-Construction Slope Stability Analysis

Lift #1



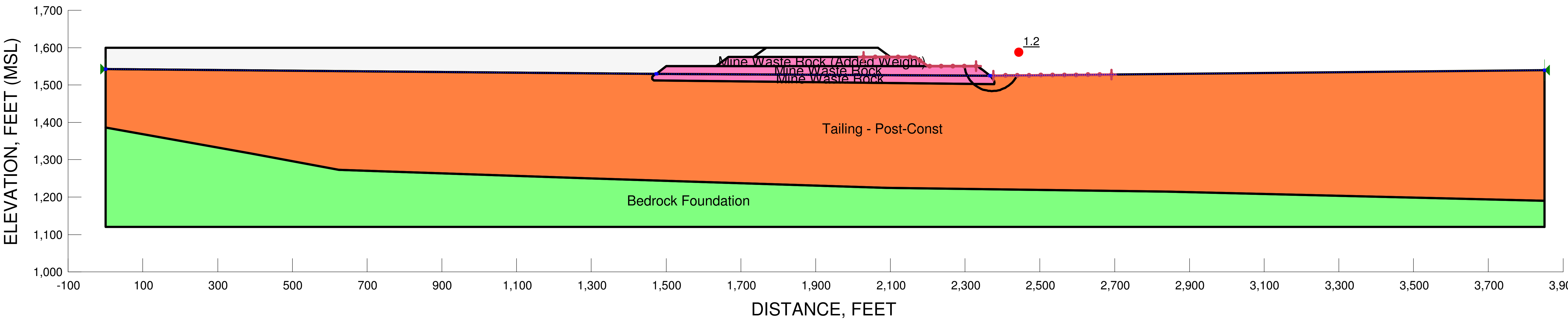
Fish Creek Waste Rock Dump
Section B
Upstream Post-Construction Slope Stability Analysis

Lift #1



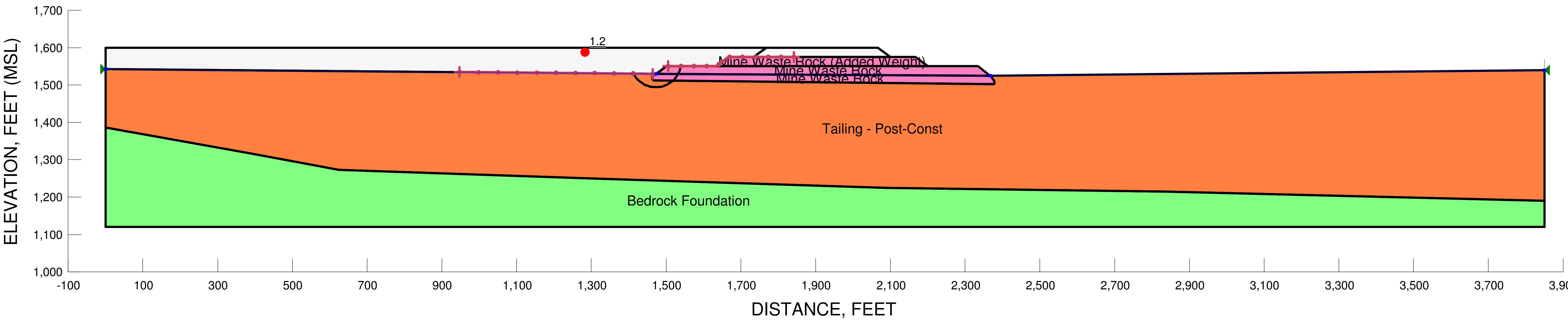
Fish Creek Waste Rock Dump
Section B
Downstream Post-Construction Slope Stability Analysis

Lift #2



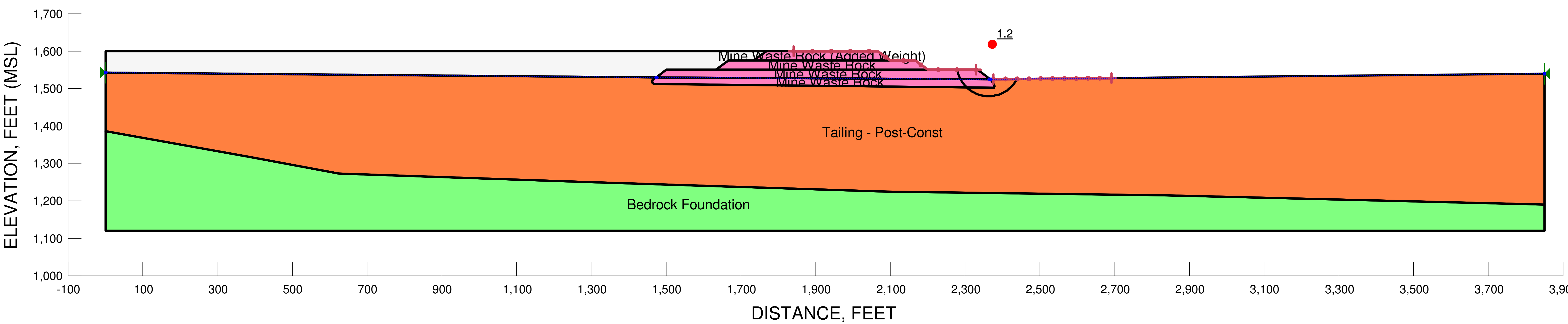
Fish Creek Waste Rock Dump
Section B
Upstream Post-Construction Slope Stability Analysis

Lift #2



Fish Creek Waste Rock Dump
Section B
Downstream Post-Construction Slope Stability Analysis

Lift #3



Fish Creek Waste Rock Dump
Section B
Upstream Post-Construction Slope Stability Analysis

Lift #3